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EGG PRODUCTION IN 1955 AND CURRENT CHICKEN NUMBERS IN SPECIFIED COUNTRIES*

Egg production in North America and Western Europe in 1955 continued the upward trend that has been occurring since World War II. These continue to be the principal egg-producing areas of the world.

The Netherlands, Denmark, Ireland, Canada, and the United States were large exporters of eggs. Indications point to an expanded output in 1956 by various European countries, primarily the Netherlands and Denmark, and total production for the reporting countries should be slightly higher than in 1955. The egg-feed price relationship in Europe is expected to continue quite favorable during 1956.

Total chick numbers in the major producing countries in 1955 changed only slightly from 1954. Chicken numbers expanded in the Netherlands, the United Kingdom, Canada, and Ireland. Reductions occurred in Western Germany, Denmark, and the United States.

In the first quarter of 1956, U. S. egg production on farms was slightly larger than in the same months of 1955. Total production of eggs on farms for 1956 is likely to exceed the 59,485 million† produced in 1955 because, at least early in the season, more replacement pullets were being raised than a year ago.

The April 1 laying flock was 1 percent smaller than a year earlier, but during the summer the national flock will probably reach the same size as last year and later may exceed year-earlier on account of the expected larger number of replacement chickens to be raised.

The resulting output could provide a basis for expanded export of eggs, particularly if the supply from other major exporting countries remains less favorable than the supply situation in the United States.

Preliminary estimates indicate U. S. exports of shell eggs by value will be slightly higher the first 4 months of 1956 compared with the same period of 1955, when exports of shell eggs were valued at 4,131,000 dollars. U. S. export opportunities for the first 6 months of 1956 should be good, since unfavorable weather conditions in Europe reduced Danish and Dutch egg supplies.

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† Because of recent revisions, this figure is not comparable to the U.S.D.A. production figure published earlier.

EGGS

Number produced[1] in specified countries, averages 1934-38, 1946-50; annual 1953, 1954, 1955

Continent and Country	Average 1934-38	Average 1946-50	1953	1954	Preliminary 1955
	Million	Million	Million	Million	Million
North America					
Canada—Farm	2,638	4,015	4,086	4,420	N.A.
Canada—Total	2,863	4,382	4,200	4,709	4,643
Mexico	1,785	1,930	2,080	2,400	2,500
United States—Farm	35,498	56,269	57,892	58,933	59,485
Europe					
Austria	663	369	845	900	936
Belgium	1,693	1,584	2,175	2,325	2,400
Denmark	1,979	1,447	2,155	2,364	2,362
France	[2]6,200	6,580	7,000	7,200	7,300
Germany, Western	4,810	2 655	5,500	6,000	5,945
Greece	550	338	525	550	575
Ireland	1,086	893	1,026	927	930
Italy	5,500	4,380	5,800	5,860	5,915
Netherlands	1,978	1,189	3,130	3,820	4,193
Norway	369	283	420	440	448
Sweden	1,000	1,288	1,375	1,380	1,424
Switzerland	423	486	520	547	N.A.
U't'd Kingd'm-Total[3,4]	[5]6,675	6,370	8,616	9,156	9,660
Other Countries:					
Turkey	1,003	859	1,094	1,094	1,260
Japan	3,553	970	5,140	5,340	5,981
Philippine Republic	[6] 738	567	1,015	1,050	1,000
Argentina	1,127	2,760	3,150	3,500	3,330
Brazil	N.A.	3,085	4,234	4,639	4,800
Peru	N.A.	N.A.	N.A.	440	421
Uruguay	289	289	330	320	325
Egypt	751	[7] 694	525	530	535
Union of So. Africa[8]	360	585	970	900	N.A.
Australia-Commercial[8]	708	1,418	1,230	1,248	1,343
Total[8]	1,848	2,388	2,220	2,280	2,400
New Zealand	430	[9] 146	[9] 190	[9] 190	N.A.

[1] Total egg production unless otherwise specified. [2] 1937. [3] Years ending May 31 of year stated. [4] Revised series. [5] Three-year average. [6] 1938. [7] 1947. [8] Years ending June 30 of year stated. [9] Receipts at Market Department stations, years ending March of year stated, which accounts for 30-40% of total production.

In 1955 the value of U. S. shell egg exports was 20,126,000 dollars, an increase of 17 percent compared with 1954. Volume was up 4 percent, with 49,725,000 dozen shell eggs being exported, compared with 47,953,000 in 1954.

Dutch production in 1955 totaled 4,193 million eggs. Approximately 178 million dozen of these eggs were exported; 5 percent more than in 1954. The most important outlet in 1955 continued to be Western Germany, which took 76.4 percent of total sales, followed by Italy and France which received, respectively, 9.4 and 7.6 percent of total 1955 exports. Average egg quality appears to have declined during 1955, with shells becoming weaker and albumen more watery.

CHICKENS

Numbers in specified countries, averages 1934-38; annual 1953,1954,1955

Continent and Country	Date [1]	Average 1934-38	Average 1946-50	1953	1954	Preliminary 1955
		Thousands	Thousands	Thousands	Thousands	Thousands
North America:						
Canada	Dec. 1	44,077	45,245	38,500	40,000	43,971
Mexico	March	[2] 36,368	38,700	50,000	60,000	70,000
United States	Jan. 1	408,177	465,503	398,158	396,776	390,708
Europe:						
Austria	Dec. 3	[3] 8,862	5,640	8,600	8,800	8,944
Belgium	Dec. 31	16,500	14,069	14,200	15,000	15,100
Denmark	July 16	[3] 27,643	22,030	24,251	25,013	23,198
Germany, Western	Dec.	[3] 51,124	N.A.	51,344	55,366	55,092
Greece[4]	Nov. 30	11,679	8,366	11,614	12,056	12,800
Ireland	June	15,961	16,677	15,995	13,462	13,511
Netherlands	Dec.	[5] 29,632	7,864	15,709	19,778	20,202
Norway	June 20	5,686	4,617	3,388	3,562	3,482
Sweden	[6]	10,980	12,467	10,932	11,777	11,648
Switzerland	April	[7] 5,544	5,674	6,200	6,300	6,340
Un't'd K'gd'm-Farm	Dec.	[9] 50,000	51,255	60,053	59,394	59,997
Yugoslavia	Jan.	18,000	[8] 17,330	16,962	[9] 22,400	[9] 22,000
Other Countries:						
Turkey		16,764	18,811	21,320	21,159	21,400
Japan	Feb. 1	51,094	17,192	36,586	41,805	40,502
Philippine Republic	Dec. 31	22,790	15,766	37,392	42,187	47,577
Brazil	Dec. 31	N.A.	N.A.	N.A.	127,000	136,707
Peru		N.A.	9,388	11,189	11,600	12,000

[1] Year-end estimates (October-December) shown under following year for comparison. Thus, for Canada for example, the December 1, 1953 estimate is shown under 1954. [2] 1940. [3] Average 2-4 years only. [4] All poultry. [5] June. [6] September 1937, June 1946-49, April 1950-55. [7] 1936. [8] 1949-50. [9] Estimate.

The Government is urging poultry breeders to give more attention to these factors.

Denmark produced 2,362 million eggs in 1955 and is the world's second largest exporter of shell eggs. During 1955 Denmark exported 139 million dozen eggs, with Western Germany importing 65.5 million dozen and becoming Denmark's leading customer in place of the United Kingdom. This occurred largely as a result of increased demand in Western Germany. The United Kingdom was Denmark's second best customer and purchased 46 million dozen eggs.

Italy imported 7.2 million dozen eggs from Denmark, substantially more than in 1954. The removal by Italy of a 12 to 15 percent tariff on eggs from Denmark may have been a factor contributing to increased imports. The tariff reduction was granted to Denmark as compensation for the tariff

imposed on Danish cheese. Other countries which took sizable numbers of Danish eggs were Switzerland, Venezuela, France and Spain.

In 1955 Western Germany, the world's largest importer of eggs, produced 6,060 million eggs. Imports during January-November 1955 reached a record of about 225 million dozen eggs; 18 percent above January-November 1954. The low market supply of domestic eggs, especially during the summer and fall, and a growing consumer demand, led to increased purchases from nearly all traditional European and overseas supplying countries. Major European sources were the Netherlands (54 percent) and Denmark (25 percent), followed by Poland, Sweden, and Yugoslavia. Overseas suppliers were Argentina, the Union of South Africa, and New Zealand which, however, had a collective share of only about 3 percent of total imports.

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* This is one of a series of regularly scheduled reports on world agricultural production approved by the Foreign Agricultural Service Committee on Foreign Crops and Livestock Statistics. It is based in part upon reports of U. S. foreign agricultural officers. A summary of this information was published in the April 2, 1956 issue of *Foreign Crops and Markets*. (Foreign Agriculture Circular FPE 3-56, April 24, 1956. U. S. Dept. of Agriculture, Foreign Agricultural Service, Washington, D. C.)

BIG THYROID GLANDS—LINKED TO HIGH EGG PRODUCTION?

Development of large thyroid glands may become a new and highly important phase of breeding and selection of poultry for greater ouput of eggs and meat. The means to determine that possibility—favorably or unfavorably—are two distinct lines of New Hampshire chickens that scientists have developed at the Agricultural Research Center, Beltsville, Md., for this purpose.

Birds making up one experimental line have large thyroid glands—birds in the other line have small glands. Both groups of chickens will be placed on similar feeds. Their records as individuals and groups will be kept and compared at the end of a specific feeding period to determine differences in rate of gain and egg production.

Making this experiment possible are investigations that were begun in 1953 by ARS poultry geneticists C. W. Knox, and W. E. Shaklee, formerly of the poultry husbandry research staff. The scientists began by making random selections of New Hampshires to be used eventually in the feeding and egg-laying trials. Test birds among the original selections were killed at 4 weeks of age and their thyroids weighed.

On the assumption that their genetic constitution would be similar, brothers and sisters of test chickens having large or small thyroids were placed in two groups as breeders and for egg-production trials.

Breeding and selection, along with the killing of test birds and the weighing of their thyroids, followed in successive generations. Now in the fourth generation, the two separate lines of chickens show wide disparity in thyroid weight. The average runs 32.8 milligrams in the "high" line, compared with 18.2 milligrams in the "low" line.

With the big difference, Knox and others who will aid him feel that the feeding trials should show whether the assumption that large thyroids are linked with high hatchability, rapid growth, and egg production is true or false. Both groups of chickens will receive identical rations used ordinarily for broiler production, and both will be housed and kept under the same environmental conditions. So far as is known, the experiment will be the first that poultry scientists have made with chickens of known and distinctly different thyroid weights.

High heritability of thyroid weight was indicated by statistical analyses as well as progress obtained through breeding and selection. This finding—should the feeding trials show correlation between large thyroids and hatchability, rapid growth, or egg production—offers encouragement to the possibilities of future breeding and selection work.

(Agricultural Research, United States Department of Agriculture, Washington, D. C., March 1956).

B.O.C.M. POULTRY AWARD FOR 1955

The 'Nobel' Prize of the poultry industry, the *"Poultry Award"* of The British Oil & Cake Mills Limited, was presented in London on February 23rd to Mr. R. G. Chalmers Watson of Drem, Midlothian, President of the British Turkey Federation and Convenor of the Scottish N.F.U. Poultry

Committee, for his outstanding contributions to the British Poultry industry during 1955.

Mrs. Chalmers Watson and his brother are partners in the largest turkey breeding establishment in Scotland, where they have 6,000 breeders comprising Broad Breasted Bronze, Whites and Beltsvilles. In addition Rupert has his own farm at Gifford where he is experimenting with the breeding of special broiler chicks. He was educated at the Edinburgh Academy and the East of Scotland College of Agriculture.

The two previous recipients were Dr. H. Temperton, Director of the National Institute of Poultry Husbandry, Newport, Shropshire, (1953), and Major Ian Macdougall, Secretary and Assistant Treasurer of the Worlds Poultry Science Association, (1954).

The award was instituted in 1953 for outstanding services to the Poultry Industry in Great Britain. It takes the form of a very large silver cup which is held for one year at the end of which time the holder is presented with a replica.

Mr. G. Chipperfield, Chairman of the British Oil and Cake Mills Ltd. and Mr. R. G. Chalmers Watson admiring the BOCM Poultry Award.

SOME POULTRY BREEDING PROBLEMS IN EGYPT

MORLEY A. JULL
U.S.O.M. American Embassy, Cairo, Egypt

The fact that the human population in Egypt is increasing relatively more rapidly than food production presents a challenge that demands the serious consideration of all agricultural leaders in this country.

Because of their shorter life cycle and their ability to produce many more progeny per sire and dam than the larger classes of livestock, chickens are relatively more efficient in producing chicken meat than cattle and sheep are in producing red meats. Also, good-laying strains are relatively more efficient in producing eggs than the water-buffalo (gamoose) and baladi cattle are in producing milk.

Some idea of the need for increasing egg production in Egypt may be gained from the data presented in 1953 by Dr. A. R. Sidky, Minister of Agriculture, in which it was shown that for every kilogram of eggs consumed in Egypt, there were 9 kilograms consumed in Denmark, 10 in the United Kingdom, and 21 in the United States. Furthermore, it has been estimated that egg production in Egypt should be increased very considerably in order that adequate supplies be available to meet the needs of the increasing population, to say nothing of exporting eggs, which Egypt used to do.

Chickens are by far the most important of all of the classes of domestic poultry in Egypt. Turkey production is increasing slightly but the number of ducks, geese, and guineas raised is relatively small. Scattered over the country are considerable numbers of pigeon lofts, squabs being quite popular among many of the well-to-do families.

In an article recently received from Anis J. El-Sosi and Dr. George B. McLeroy of the Abu Ghraib Agricultural College in Iraq, they state that according to archeological evidence, ducks and geese apparently preceded chickens as domestic birds in Mesopotamia. From my limited observations in visiting numerous tombs of ancient Egyptian monarchs, ducks and geese appeared more frequently than chickens in the numerous hieroglyphics encountered.

Concerning guineas, which I mention because of their African origin although they are not numerous in Egypt,

Julian Huxley's exceedingly well written book "From an Antique Land" contains the following quotation:

"Turkeys were first confused with guinea-fowl and the fact that guinea-fowl were introduced to the West through the Turkish dominions was confused with the country of their origin: The real African origin of the guinea-fowl was only indicated in their name when the Portuguese began bringing them back from the Gulf of Guinea." (Perhaps the minds of many readers of this article could be refreshed by reminding them that the Gulf of Guinea is off the west coast of Central Africa).

NATIVE EGYPTIAN BREEDS

The three native breeds of chickens include the Baladi, Dandarawi, and Fayoumi. Each of these breeds is somewhat smaller than white Leghorns and all three breeds lay relatively small eggs.

Mr. Milo McFeeters of New Wilmington, Pennsylvania, who was located at Assiut, Egypt, in 1924, started breeding Baladi chickens for better egg production. Some progress was achieved and eventually a strain of White Baladi and a strain of Red Baladi were developed. There are still a few Baladi raised in some parts of Egypt.

The Dandarawi breed resembles Light Brown Leghorns somewhat but are not at all prevalent.

The Fayoumi breed is more popular than the others but should be improved with respect to body size and egg size. Breeding projects are under way to accomplish this goal. Since the heritability of body size and of egg size is each relatively high, the mass selection of prospective breeding stock for a few years should accomplish much.

Recently, Dr. M. T. Ragab and Professor M. A. Assem, poultry department, University of Cairo, submitted a report on the laying performance of the Baladi and Fayoumi breeds. Average clutch size in the Baladi was 1.74 and in the Fayoumi 1.87, relatively low as compared with American breeds. Average annual egg production in the Baladi was 154 and in the Fayoumi 156, quite low as compared with reasonably well bred flocks in England, Denmark, Holland and the United States. Part of the relatively low egg production in native Egyptian breeds is probably due to the effects of the kind of diets fed the birds and a rather prolonged period of summer heat. Protein supplements of animal origin are very deficient

in Egypt so that animal protein products and antibiotics have to be imported to provide laying flocks with reasonably well balanced diets. At the same time, the Egyptian native breeds lay much better than laying flocks in Iraq, about 60 eggs per bird being the average, as reported by Messrs. El-Sosi and McLeroy.

Another interesting fact about the Fayoumi breed is the relatively lower hatchability of their eggs than White Leghorn and Rhode Island Red eggs, according to Egyptian research workers. Also, Fayoumi chickens have dark-colored skin and shanks. However, by making the proper crosses, it should be possible to produce a strain with plumage resembling that of the Fayoumi but with yellow shanks and skin.

BREEDING FOR RESISTANCE TO DISEASE

In all countries, poultry diseases of one kind or another have been a serious handicap to producers of poultry meat and eggs. In those countries where the environmental conditions under which poultry are kept and methods of flock management are substandard and where it is difficult to secure animal-protein supplements and certain antibiotics necessary for properly balanced diets, losses from mortality are often of serious proportions. Also, in numerous countries there has been little or no serious attempt on the part of poultry breeders to develop strains of breeding stock that are relatively resistant to the more important poultry diseases.

It is impossible for a strain of birds to be resistant to a disease without having been exposed to the organisms that cause the disease. That is why the chicks of native stocks sometimes suffer considerably less mortality than imported chicks hatched from "foreign" breeds that had not been exposed or not as severely exposed to certain disease organisms as had the native birds for several years previously.

In spite of the somewhat serious outbreak of disease among imported chicks in Egypt two years ago the progeny of the survivors are at present exhibiting considerable resistance to disease in general. The same thing will probably take place in Iran, where losses from an outbreak of Newcastle disease have recently been quite severe, according to Mr. Wali Meshkati, Director General of Agriculture, Ministry of Agriculture, Teheran, Iran, who visited my office recently. The survivors will undoubtedly develop a considerable degree of resistance to Newcastle and other diseases.

BREEDING FOR HIGH EGG PRODUCTION

By far the most important problem confronting the poultry industry of Egypt is the need for developing a sound and long-time program of progeny testing for high egg production. Progeny testing is of basic importance because the heritability of egg production is relatively low.

Progeny testing to develop high-laying strains involves the selection of prospective breeding stock on a family basis.

It is necessary to determine the average egg production of all of the daughters of each dam and each sire. Excessive culling of the daughters should be avoided and the mortality that occurs in each family of daughters should be taken into consideration when the time comes to select future breeding stock on a family basis.

It would be desirable to secure from each dam and each sire to which she was mated eight or more daughters to put in the laying house. Mortality during the growing season among the respective progenies of each sire and dam should be taken into consideration in order to secure information concerning resistance to disease on a family basis.

Females for future breeding purposes should be selected first from among the progeny of each sire that proved to be superior in transmitting high egg production and second from among the full-sister progeny of each superior dam. The ability to identify sires of superior breeding worth is more important than the ability to identify dams of outstanding breeding worth because each sire has several times as many daughters as has each dam to which he is mated.

It is desirable to mate as many as 15 or more females to one male, at least three families of five or more full sisters being desirable. In order to hope for much progress in progeny testing to develop high-testing strains of a breed or variety, at least 15 single-male matings should be maintained from year to year.

Progress achieved in Egypt in the years to come will depend upon personnel well trained in sound poultry management practices and thoroughly experienced in the techniques of progeny testing.

POULTRY BEHAVIOUR*

D.G.M. WOOD-GUSH,
Agricultural Research Council, Poultry Research Centre, Edinburgh, Scotland

For many years the chicken has been studied by psychologists and animal behaviourists but only recently have some problems relating to the poultry industry been under investigation. It is not surprising therefore that a discussion on Animal Behaviour and the poultry industry should centre mainly on the type of problems in which this discipline could be helpful, rather than on its achievements that might be of use to the industry.

Although the chicken was first used for the investigation of certain problems of psychology by an Englishman over eighty years ago, the work on the social behaviour of the adult bird stems mainly from the investigations of Professor Katz and his co-workers, notably Schjelderup-Ebbe, who made the first observations on the peck order of chickens. Their work has been expanded and studied under more practical conditions in the United States, and today it is realized that the peck-order forms the basis of all group behaviour in adult chickens. Briefly the peck-order means that in a group of birds one bird is dominant and pecks all the others, the second bird pecks the others but is pecked by the top bird; the third bird is pecked by two but pecks the rest, and so on—while the last bird is pecked by all. Slight exceptions to this occur but it is the general rule. The more recent work on the peck-order shows that birds high in the social hierarchy have priority for food, nests and roosting places. These effects have become obvious with the degree of crowding.

With increasing research it is becoming evident that much infertility may stem from behavioural factors as well as from physiological ones. Birds differ a great deal in the frequency at which they will mate. This has been found to be the case with males and also with hens and pullets. Females at the top of the peck-order are less inclined to crouch for cocks than hens lower down the social scale, but as this is a statistical concept many exceptions may be found. In one case when the top ranking hens froms several pens were put in together it was found that their crouching rates increased and surpassed those of their previous social inferiors. Dr.

*Presented at the Annual Meeting of the United Kingdom Branch of the World's Poultry Science Association, London, April 20, 1956.

Osborne and I have recently investigated the sex drive of a large number of cockerels and found quantitative differences between males that appeared to be genetically determined; males from different families differed significantly in their sexual vigour, and these differences were unrelated to general vigour and appearance. A comprehensive study of the relationship between the frequency of mating and fertility of the male remains to be done. In our work the males with highest sex ratings fertilised more eggs than the cockerels with the lowest sex rankings. It may be, however, that the fertility of the cockerels which mated at medium frequencies is higher than that of the most sexually vigorous males for the latter may copulate too frequently to allow mature sperm to collect in their seminal vesicles. Since the differences in sexual vigour can be due to genetic differences it is possible that in selecting for other genetic characters, such as say resistance to a particular disease, the sexual vigour of the cockerels might be affected by the process of genetic drift, and decline to a point where infertility is involved. It would be convenient to know the factors underlying this state so that the sex drive of otherwise genetically valuable cocks can be boosted. Our work indicated that low sexual vigour was not related to a lack of male testicular hormone and suggested that it was due possibly to differences in the neural mechanisms of the animals, or to a deficiency in some substance(s) that might interact with the testicular hormone. The ageing cock presents a somewhat similar problem, for after being progeny tested a cock is often beyond his prime. A joint attack by physiology and animal behaviour would be beneficial to the industry if a cheap and efficient method could be found to increase the sexual vigour of such birds.

Where several males are kept with a group of females under fairly intensive conditions, the males form their own peck-order independently of that of the females, and the dominant male often prevents the others from treading the hens. I have recently investigated the relationship between the peck-order position attained by the male and his sexual vigour. A large number of cockerels were used and no correlation was found to exist between a male's potential peck-order position and his sexual vigour. In other words, where several males are kept with females the dominant male is not necessarily the most vigorous sexually, so that the fertility of the group may suffer. Also the general aggressiveness of the

cock was found to be unrelated to his mating potential. This means that choosing the cockerel by the criterion of general vigour is not entirely reliable, for other equally healthy but quieter cockerels may give better fertility.

Preferential mating is a subject that is often discussed. However, many of the reports can be easily explained by other causes when the data are analysed. A typical example of this type is the following: Cock A is put into a pen of twenty pullets and all lay some fertilized eggs. Then Cock A is removed and, after a suitable time lapse, Cock B is put in the pen. All the pullets continue to lay but only fifteen lay fertilized eggs and this is reported as being due to preferential mating. However, from what I have said about differences in sexual vigour between cocks it is possible that Cock A mated more frequently than B and thus trod all the pullets. Nevertheless, two workers who observed the birds for most of the time reported preferences of the cocks for certain females. Preference exercised by the female may be just as effective and using five Brown Leghorn cocks at Edinburgh I found that such preferences were shown under the conditions of the experiment. Each of these cocks was released singly into a pen of pullets and hens for a given period, using a total of three pens. All the crouches accorded him were recorded as well as each display action done by the cock. It was found that there were significant differences between the number of crouches given to each cock and that these were related to the amount of display done by the cock and also to his body size, for one large but quiet cock received more crouches than smaller but more active cocks. Sometimes one hears of possible preferential mating when birds of different breeds are used, and it is hoped that this will be investigated in the near future. Once the basis of any such preference is known it may be possible to obviate it.

So far I have dealt only with behaviour in relation to fertility for it is the field in which I mainly work, but other economically important facets of the reproductive "drive" that lead themselves to investigation by the animal behaviourist are nesting behaviour and broodiness. As every farmer knows, floor layers mean extra labour, spoilt records, loss of eggs and finally eggs on the floor are golden opportunities for egg-eaters. It would be nice to know the stimuli that entice birds to nest and how these may be changed to entice the persistent

floor layer into the nest. Then there are the occasional birds that persist in nesting long after laying and, by occupying a trap nest, force other birds to lay on the floor. What are the reasons for this and how can it be obviated? The nesting behaviour of birds has received very little attention and broodiness has received even less.

Social malpractices such as cannibalism and feather pecking are also good subjects for the behaviourist. As yet nothing is known about the stimuli that initiate outbreaks of either of these; indeed, it is uncertain whether cannibalism usually develops from feather pecking or whether the basis of either trouble lies in environmental factors such as nutritive requirements or extreme climatic conditions. Furthermore it might be useful to study the behaviour of birds in relation to exposure and infection by more common poultry diseases, and we might learn additional ways to defend ourselves from expensive losses.

The study of feeding behaviour may indeed be the most promising field of research to the practical farmer, but as yet very little work has been done on it. A German worker, Engelmann, has contributed most of our knowledge on how chickens form their preferences for certain types of food. It is well known that chickens possess few or no tastebuds, and Engelmann has found that food preferences are based on form, colour and possible tactile impressions. Shiny or glittering surfaces may also be important. A precis of one of Engelmann's experiments will serve to illustrate these findings. He found that his birds had a very strict preferential order as follows: Wheat: maize: rye: barley: oats. When these cereals were presented to the same fowls in ground form, wheat, rye, oats and barley were eaten at the same frequencies. Ground maize and ground peas were less popular and Engelmann suggests that this was due to the fact that maize and pea meal are crumbly, less compact, less easily eaten than the others and different in colour. He also carried a series of experiments with artificially made grains. When "wheat" and "rye" grains were made from rye meal the "wheat" grains were significantly more popular. When "rye" grains made from wheat meal were presented with "rye" grains derived from rye meal both were equally popular. Then he presented "rye" grains from wheat meal with "wheat" grain from rye meal and found the "wheat" grain the more popular. Finally, when wheat

grains from rye meal and real rye grains were offered, he found that the "wheat" grains were the most popular. From this type of work it is evident that practical applications may be possible. It is said by some nutrition experts that the average bird in this country receives too much protein. Protein-rich foods are expensive and often very popular with the birds so that when possible, they usually take too liberal helpings. It might be useful therefore to investigate how cheaper and less popular foods can be made more popular and how the most popular can be made less enticing so that cheaper and yet nutritionally satisfactory rations may be evolved. Then there is the question of whether birds possess a chemical sense whereby they can recognize short-comings in their diet, but this has received very little research. Social factors may also play a role in feeding behaviour, for the presence of other feeding birds may induce a bird to eat more. Another German worker found that the larger the pile of food in front of them the more the birds ate. Probably many points similar to this are known and practiced by farmers, but further research along these lines would be extremely beneficial not only to the industry, but to other scientists particularly those engaged in nutritional research.

So far I have dealt only with chickens, but many of these points will apply to other types of poultry. Various species of ducks have been used for studies in animal behaviour by Lorenz and his colleagues, but their work although of the most excellent standard and originality is very far removed from problems of the industry. In the United States a growing body of scientists is working on the behaviour of the Turkey, principally into the relationship between mating behaviour and infertility. However, the list of possible behavioural problems that I have recounted is not exhausted. I have dealt only with birds kept under semi-intensive conditions but other types of poultry husbandry, e.g. the deep litter system, and new branches of enterprise such as the broiler industry will all raise new problems to which Animal Behaviour may contribute. I do not wish to hold my subject up as a panacea, but taken in conjunction with other scientific disciplines, there is every hope that it will make appreciable contributions on the scientific and practical levels.

ARTIFICIAL INSEMINATION IN POULTRY*

MISS D. M. COOPER

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In giving this paper on artificial insemination this afternoon I think that in view of the time allotted I shall give a very brief description of the technique illustrated with slides and then discuss the value and limitations of the technique in poultry breeding.

I think it should be made very clear at the outset that I am not advocating the wholesale use of artificial insemination in poultry breeding. I feel that it will have a definite place, but it must be realized that it is no magical formula which will answer every problem in infertility. Some people, I am afraid, seem to think it to be a nice, easy way with which one can reap tremendous profits without any work. I think you should forget such wishful thinking. You can acquire financial benefits, but as in everything else it does require some effort.

From the economic view I should say that the use of artificial insemination in flocks of broad breasted turkeys (known as the super type) is where the greatest financial gain is to be made. There may be an increasing use of this technique by the breeder of table poultry particularly from battery-kept stock. Thirdly, there may be a very limited use by breeders in progeny-testing. In regard to this last point I am not sure what, if any, will be the official attitude to the use of artificial insemination for progeny-testing in accredited flocks.

Although artificial insemination is not new, its use has only come into prominence during the past three or four years—primarily because of the infertility problem in turkeys. As early as 1913-14 research workers were intrigued by its possibilities but it was not until 1937 when Burrows and Quinn of the United States Department of Agriculture described their techniques for the collection of semen, did it become possible to collect sufficient semen to warrant its use in commercial work. The basis of the technique which is called the "massage technique" is that of a conditioned reflex in which the cock or stag is stimulated to erect and evert the

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rudimentary copulatory organ following which the semen is "milked" by squeezing the semen from the bulbous ducts. Stimulation in the cock is done by stroking the back while in the stag it is necessary (because of the size of the bird) to massage the fleshy part of the tail. As the semen flows from the copulatory organ it is collected by means of a collection apparatus. This consists of a graduated pyrex centrifuge tube, two short pieces of glass tubing 4 mm. diameter, one of which is bent at a 90° angle about an inch from one end, the other into which is fitted a length of polythene tubing. By sucking on the mouthpiece a negative pressure is produced, which results in the semen running into the centrifuge tube. The apparatus is fitted into a half pint vacuum flask filled with water at about 55-60°F. The advantages this apparatus has over the conventional funnels or wide-mouthed vials are several. The sample may be collected free from faeces and excess urates, there is the measurement of volume of semen collected and what is perhaps its greatest advantage, the ability to collect even the smallest amount of semen left adhering to the copulatory ogran. This is of particular importance when collection is made from stags as I shall mention later.

Insemination of the hen whether chicken or turkey is basically the same. It involves applying pressure on the abdominal muscles in such a way as to cause the oviduct to be everted outside the vent. The inseminating syringe is then inserted into the oviduct, the pressure released on the abdomen and the plunger pushed to deliver the required dose. Releasing pressure on the abdomen prevents the "flow-back" of semen as does the slight twisting motion when withdrawing the syringe.

I am not going into more detail about the actual technique as I am sure you will appreciate it is rather difficult to describe without having birds on which to demonstrate or perhaps having a cine film of the technique. There are several points I should like to make about learning this technique. It is not difficult to learn—it is more of a knack than anything else, but it is not enough merely to stand and watch someone demonstrate and then think it is as easy as rolling off the proverbial log. It takes a lot of practice and more than a small amount of patience. I should also like to emphasize that if there is any likelihood that you may need to use artificial in-

semination on your flock that you do not wait until after the first one or two hatches and then think you will be able to learn everything in five minutes and be able to have fertility up to a high level inside of a week. We have had numerous enquiries requesting information about using artificial insemination in turkey flocks, and at the end of last season we sent out a questionnaire to see what sort of results people had. I must admit that the greatest number didn't get along at all well. But those who did were very enthusiastic. Some of the troubles were that it was found to be not perhaps as easy as was first thought; there were staff who didn't like the idea and were not willing to learn; and then there were the staff who did learn but decided that since there was considerable physical effort involved especially in handling large numbers of birds that they wanted more remuneration if they were to do the job. I should say on this last point that I think if you want to use artificial insemination on a large scale then it is going to become necessary to have some sort of incentive bonus. I know I should want one!

Before going into the gains obtainable from artificial insemination, I think it would be a good thing to answer a few points such as the amount of semen which is likely to be obtained, the dose required for insemination and the length of time the hen remains at a high level of fertility. The general consensus of opinion both in this country and in the United States is that stags should be milked three times weekly on alternate days for optimum volumes. I have used this system on my stock cockerels and find it very satisfactory. I do know of one poultry breeder who using artificial insemination in progeny-testing milked his cocks six days a week for a period of 8 or 9 weeks without great reduction in volumes obtained per cock/per day. I should hesitate to milk cockerels on this basis if a very long breeding season was contemplated, but if testing for eight or ten weeks, it should be quite satisfactory. Turkeys on the other hand do not respond to such frequent handling, and Lorenz in California has shown that density is affected when volume is reduced drastically. By milking stags daily this point may be reached within a fortnight so I should suggest that you stick to 3 times weekly collections.

Volumes of semen obtainable from cockerels varies between breeds and between individuals within the breed. We have worked with Barred Rock, Single Comb White Leghorn

and Rhode Island Red cockerels at Houghton and have found the average volume per collection in Barred Rocks to be about 0.7 ml. in White Leghorn, about 0.4 ml. and in Rhode Island Reds about the same as for Barred Rocks. This year is the first year we have had Rhode Island Reds and the range in average volumes produced among 24 cockerels ranges from 0.3 to 1.58 ml. The greatest amount we have yet collected at one time was 2.8 ml. from one of the Rhode Island Reds. The volume obtainable from stags however, is very much less—the flock average is nearer 0.2 ml. and I consider an exceptional stag will give 0.5 ml.

Since insemination in the chicken requires a dose of 0.1 ml. once weekly or 0.05 ml. twice weekly it means that with the heavy breeds it is possible to mate 36 or more females to the male, but with the White Leghorns it is probable that you can mate as many, if not more, naturally. To give you an idea of persistence of fertility I should like to show a slide illustrating the degree of fertility obtained after a single inseminating dose of 0.1 ml. As you will see the peak fertility is reached at the third day and there is a steady decline until the sixth day, after which there is a very sharp drop. Insemination of turkey hens on the other hand need be done only every three weeks with a dose of 0.025 ml. This frequency of insemination and dose was shown to be optimum for maximum use of semen and labour in the United States. This slide shows the fertility obtained by Lorenz with an inseminating dose of 0.05 ml. As you can see fertility remained very high for almost a fortnight and then gradually declined. With the present cost of labour and price of poults in this country it may be that breeders would find that it still would pay to inseminate fortnightly for the extra 3 or 4 percent fertility gain over a three-week inseminating period.

If any of you were doing a little arithmetic you will have calculated that by obtaining 0.2 ml. of semen per collection it would be possible to inseminate 24 turkey hens per week, or 72 per three-week period per stag. But don't let enthusiasm for theoretical calculation run away with you. Remember that stags do not give the same amount of semen per collection, that there is a seasonal decline in volume as the season progresses and that there is likely to be 3 - 5 percent of your stags out of production at any one time. There is also the possibility of an outbreak of disease—blackhead, arthritis, etc.

which can really put you in a very awkward spot. Finally it must be remembered that turkey semen is very viscous and a certain amount always sticks to the syringe, so that it is not possible in fact to get 40 hens per cc. I should emphasize that even when experienced not to cut down on the number of stags much below 1 to 25. The first year you try the technique don't cut down at all—in fact it would be better to have some spares. Remember it may take two or three weeks to condition the stag before they are producing sufficient semen to be of practical value.

How should males be kept for artificial insemination? Chickens must be kept in individual cages—we use cages with solid floors giving the birds about 7 - 8 sq. ft. with 2′ 6″ headroom. This point on headroom is important. Turkey stags I think can be kept satisfactorily in pens of 8 - 10 birds providing of course that they have been reared together. Don't have the pens too large so there is a lot of chasing around in order to catch them. The secret is catch the bird quickly, collect semen quickly and then let them go. In practice this may be not as easy as it sounds and requires a bit of thought in organization. Perhaps I should mention here that hens should be inseminated in the afternoon by which time majority will have laid. The presence of a hard shelled egg in the oviduct will cut down the fertility for the following week.

What sort of fertility will you get from artificial insemination? With turkeys it will depend on the degree of fertility you are getting from natural mating. Fertility in the super-broad breasted flocks runs from 40 - 50 per cent on an average while in flocks with breast width not developed to the same extent fertility may be 75 percent or better. Whether one should go over to using artificial insemination exclusively and produce birds with this unnatural conformation or whether it would be more prudent to select for conformation plus fertility and perhaps then only use artificial insemination to supplement fertility early and late in the season is not for me to decide. At the present time the market seems to be clamouring for birds of the super-conformation and this type of bird I feel it is possible to produce economically only by the use of artificial insemination.

The degree of increase in fertility by artificial insemination will depend on the natural fertility of the flock—40 per cent increase is not unheard of in flocks in which natural

fertility is 40 - 45 per cent while in flocks in which natural fertility is 75 per cent one would not expect more than a ten per cent boost. Stotts and Darrow in the United States did three years work on the use of supplementing natural mating with artificial insemination. Some 31,000 hens from 21 flocks were involved and they found that in high fertility flocks (80-85 per cent) an increase of 7 per cent was obtained, while in low fertility flocks (70-74 per cent) it was possible to get up to 12 per cent increase. They also noted that it was more difficult to fertilize eggs later in the season than it was during the early part of the season, but nevertheless artificial insemination did maintain fertility in the latter part of the breeding season.

Insofar as chickens are concerned there are no advantages such as increased fertility by using artificial insemination. There is, however, the advantage of keeping up late season fertility but do remember that even if fertility is above 83% during May, June and July, there will be a drop in hatchability of eggs set though not as great as in the case of natural matings.

I have left speaking about diluents and storage to the end of this paper because it is perhaps the biggest stumbling block to the widespread use of the technique commercially. I wish I were able to give you a good diluent with which I could guarantee results as good as you would get by using undiluted semen. We have done a lot of work with glycine as a diluent for chicken semen and at the same time trying to store, but have had trouble in repeating results. We feel that although we are optimistic, it is just too soon to suggest diluents in the field. I hope by this time next year to have some definite recommendations—one way or the other. Meanwhile I do think that since artificial insemination in poultry will be done by the breeder and not by a team of inseminators a la the Milk Marketing Board, it should be essential that the breeder himself knows what degree of fertility he can get by using fresh undiluted semen. Our present recommendation is to collect enough semen to be able to last for one hour. In practice this means about 120 hens in batteries or about 75 turkeys.

I realize that I have left a number of questions unanswered but I have two people anxiously waiting to give their comments on artificial insemination from the practical aspect. I think I had better let them have their say.

THE PRACTICAL VALUE OF ARTIFICIAL INSEMINATION TO THE POULTRY INDUSTRY FROM THE DOMESTIC FOWL ANGLE.*

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The reason for my being asked to speak on the subject of artificial insemination is that I took part in the first large scale operation which was carried out at the Production and Progeny Trials in 1951. Therefore, it would seem to be appropriate for me to recall the circumstances that influenced the Trials to embark on the programme. As most of you are well aware, each series of Trials takes two years and consists of a 48 week parent production test, during which the parent birds are tested for the hatchability and rearability factors, and the resultant progeny are subsequently tested for production, again over a 48 week period. In the first Trials held at Goosnargh, that is the 1949/51 series, immediately prior to the one in which artificial insemination was used, the male birds sent by each competitor to mate with the 100 parent pens, were received by the Trials in January 1950, following the commencement of the parent production test in the previous October; the point being, of course, that there was no obvious purpose in having the birds mated from October to December when no hatching eggs were required until February.

In October, 1950, the 100 pens, each consisting of 12 mature pullets, were received to mark the commencement of the 1950/52 Trials. Very shortly after this the Fowl Pest position deteriorated very rapidly, to the extent that widespread restrictions were imposed upon the movement of poultry throughout the country, which meant that unless an exemption was forthcoming from the Ministry's Veterinary Division, the male birds could not be accepted and the second and all important part of the Trials could not take place.

Financially, the Trials stood to lose considerably, which it could ill afford to do at such an early stage in its career. The powers-that-be at the Ministry decided that an exemption allowing the movement of the male birds from so many different sources involved too great a risk; at the time their refusal seemed harsh, but it must be said that, to give the devil his due, I think that on looking back they were right.

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The outlook was very black indeed, until Mr. Jim Sutton, the Chairman of the Trials, hit upon the idea—or should I describe it as a brainwave—of artificial insemination. Dr. Gordon of the Animal Health Trust was approached and, despite the limited knowledge on the subject and the non-existence of any work other than of an experimental nature, he agreed to tackle the job but, quite rightly, gave no guarantee for its success. At the Research Centre the Trust immediately got to work on practising and experimenting with the various techniques involved. There were hurried conferences and I well remember one with the late Dr. Black of Reading. I think I am right in saying that he was the only man on this side of the Atlantic with some working knowledge of artificial insemination. He put something of a damper on our optimism and, although, fortunately, things turned out better than he predicted they might, his advice proved to very valuable.

In the meantime, we had succeeded in persuading the Ministry people to allow the introduction of a few cockerels from four or five breeders. In the course of practising the technique of milking the cockerels and getting the cockerels used to the handling, a small pilot experiment was carried out at Goosnaugh with the actual inseminating technique and the few eggs that were put into the incubator, showed that at least we were on the right lines. There were six Rhode Island Red cockerels, 3 Light Sussex and two or three light breeds and there were at least 1,000 birds to inseminate. To be 100% successful from each pen of not more than 12 birds each, we had to get approximately 80 fertile eggs to be reasonably sure of obtaining 20 mature pullets for the progeny production test.

It soon became apparent that the light breeds were a complete failure. This may have been due to the particular males involved, but it seems that subsequent work by Miss Cooper shows that light breeds in general do not take kindly to the artificial insemination technique, due to their temperament, nor do the small semen yields obtained offer much encouragement, even on the basis of present day knowledge.

The failure of the light breeds led to the decision to use Rhode Island Red semen on the pens included in the light breed and A.O.V. Heavy Sections. This was made possible because the semen yields from the 6 Rhode Island Red males were far in excess of anticipation, which had been based on the highest figures quoted in the papers relating to previous experiments. The Light Sussex gave poor results at first, but

they were persevered with and, eventually, the results were satisfactory but, of course, the three males involved had proportionately far less birds to cover than had the Rhode Island Reds.

As the work progressed, the fertility percentage increased, mainly due to the progressively high semen yields from the Rhode Island Reds and the fact that sufficiently fertile eggs had been obtained from a number of pens, so enabling larger and more frequent insemination of the remainder. For some unknown reason, there were odd pens from which it was extremely difficult to obtain fertile eggs but there came a time when we had to call a halt, as any further chicks that could be produced would have been hatched too late in the season. So with the production of 2,500 pullet chicks, the second half of the 1952 trials was ensured, if on a limited scale. The task completed, I think that to be quite honest, my first reaction was . . . "thank goodness for that."

The main problem had been in keeping a check on the numbers of the birds that had been inseminated, as in making the best use of the semen available, we often covered only four, or perhaps six birds in a pen and in the later stages in particular, I spent many long evenings in testing eggs that had been set only a few days before and making all sorts of calculations and estimates, even to the extent of counting eggs before they were laid so that, on the following day, the insemination could be carried out on the pens that appeared to be most in arrears.

There was no doubt that the work on such a large scale had taught us a great deal about artificial insemination and that had we known as much about it at the beginning as we did at the end, the work could have been completed in about half the time and with even greater success. It certainly gave me much food for thought but, since 1951, my assessment of the value of artificial insemination has not altered very much. Even then, it was obviously only a matter of time before improved technique and greater knowledge would succeed in producing results comparable with natural mating. This has been achieved but, under normal circumstances, I believe that for the production of commercial chicks the old fashioned method can not be improved upon.

I believe artificial insemination is being used for the production of table chicks from birds in laying batteries. I sincerely hope it is not too successful, for somebody is sure to try to produce potential laying stock by the same method.

On the other hand, I believe that from the poultry research angle it must have a great future and I am thinking particularly of work on disease control, as well as such things as nutritional problems in relation to hatchability. In the field of pedigree breeding and progeny testing, it must also have great value; as more females can be covered by one male with artificial insemination than with natural matings. There is the obvious advantage of making use of it with what may be either an outstanding cockerel or a proven cock.

I believe that in the case of second year males, there is a reduced potential with artificial insemination as there is with natural matings but I take it that the pro rata increase in coverage of females can still be obtained. I am informed also that in America artificial insemination is successful in the multiple shift system of breeding, as the greater control obtained means less wastage of eggs between each switching of males.

Probably one of the foremost advantages of artificial insemination in progeny testing would be in Trials work, in much the same way as it was used as a matter of necessity at Goosnargh. I have never made any secret of the fact that the single male bird which sires each progeny pen at Goosnargh is in my view the one weakness. Nevertheless, I must say that it is still the best test for pedigree breeding devised so far. Although I must give the breeder some credit for choosing the right male to mate with the particular pen of birds, most breeders will agree that there is a certain degree of chance involved. At Goosnargh the influence of that one male can be enormous and yet, we cannot be sure that it is fully representative of a breeder's flock. To my mind, the only true assessment of the breeding value for public progeny testing purposes, is to find a common factor for one side of the mating. This can be achieved on the male side by means of artificial insemination with a small group of males and using pooled semen. I raise this point with the Ministry's new testing scheme in mind also. It is their intention to start the test with a random selection of eggs taken from the farm and, therefore, in theory at least, they should be getting eggs from many different sires and dams. I accept that the eggs will be produced in different environments but the fact remains that each man's stock will be very thoroughly tested for hatchability, rearability, productivity, etc. and, therefore, I see no point whatever in confusing the issue by repeating the process but with only two sires. Granted, two sires are better than one, but I would prefer to express it as being only half as bad.

If the initial stock is to be put through a breeding test, then the birds should be viewed in the same light as foundation stock supplied by one breeder to another and subsequently mated with completely different strains. This is where artificial insemination would be the complete answer. It may not be appropriate to this discussion but, while on the subject of the Ministry's testing scheme, I might add that unless artificial insemination is used in the way I have mentioned, I think the second half of the test should be scrapped, as I should have far more faith in the results from the first half taken over a three-year period than I would have in the test in its present form.

I must now refer to the biggest problem yet to be solved in artificial insemination, namely, the storage of semen. If the answer can be found, then in many ways it must surely be what we might call a dream come true for the pedigree breeder. To mention but a few advantages, there would be the ready made insurance against the complete loss of his strain through Fowl Pest; the much safer method of obtaining fresh blood that the movement of semen rather than stock would permit even under Fowl Pest restrictions; the much greater use of prepotent sires by milking and storing during the out of season period; and again, it would be of even greater value in the field of research and progeny testing. In fact, artificial insemination might then become part and parcel of any breeding programme.

There is one further use to which one part of the artificial insemination technique might be put. I doubt if any breeder has ever got through a season without finding one or two failures in his stock cockerels and, it seems to me, that if all the males were tested prior to the breeding season for semen yield, but more so for sperm count, some saving could be made. It may be that low fertility with natural mating is not necessarily linked with low semen yields, as in light breeds for instance, but it should not be difficult to check this point if it has not been done already.

Finally, I would suggest that to interest the breeder further, there should be made available to him a simple set of instruments for the job, complete with some easy-to-follow instructions. In other words, I think the time has come for an artificial insemination kit to be put on the market.

Just one last request for Miss Cooper—solve that storage problem.

THE PRACTICAL VALUE OF ARTIFICIAL INSEMINATION TO THE TURKEY INDUSTRY*

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May I commence by saying that as a breeder of Broad Breasted Norfolk White turkeys my practical experience of artificial insemination has been limited to my particular strain and I cannot, therefore, say whether the same results would be obtained with bronze and other varieties. I hold the view that Broad Breasted White turkeys are the birds of the future and, therefore, all my remarks must be confined to this variety.

There can be no doubt that artificial insemination has come to stay but I would like to make it quite clear that artificial insemination is not by any means as easy to carry out as many people imagine. Turkeys are far larger than chickens, take a good deal of handling, and it is quite easy to break their wings or to put hens right out of lay if handling is not carried out really well.

The first thing that one needs to have is patience and, unless you are patient, it is not a bit of good to attempt artificial insemination. The turkeys must be handled very carefully for otherwise the chances are that they will not respond. May I give you an example. When one member of my staff attempts to manipulate the stags there is never any response. Perhaps he holds them too tightly or too fiercely but, whatever it is, the stags do not feel at home and do not respond.

On the other hand, I find that I can milk the stags without much difficulty but I always try and dodge the job of everting the oviducts in the hens because, quite frankly, this is a job that I cannot get the hang of. This may sound a surprising statement in view of the fact that I was probably the first Englishman to sex chickens and turkeys.

The importance of proper handling is borne out by the experience of other farmers. To my knowledge, about half a dozen turkey breeders in Norfolk are carrying out artificial insemination on a commercial basis. On the other hand, I know a number of other breeders who have tried and who are unable to get any results whatsoever. I feel, therefore, that this question of handling is going to be a limiting factor on the spread of artificial insemination.

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* Presented at the Annual Meeting of the United Kingdom Branch of the World's Poultry Science Association, London, April 26, 1956.

Now let my try and give you very briefly some of the main values of artificial insemination from the turkey farmer's point of view.

Very often turkeys are infertile early in the season due to the females maturing before the males. We check up on fertility after the first eggs have been in the incubator 7 days and if fertility appears to be unsatisfactory, then out we go and artifically inseminate the pen concerned. After that artificial insemination is only used when fertility falls below 90%. In other words artificial insemination is of very real value in combatting early season infertility.

Early season infertility may also result from birds beginning to squat a week or two before they are expected and before they have actually been mated up. Turkeys squat ready for mating a little while before eggs are produced and I find that if squatting does occur amongst unmated birds, then it is a good idea to artificially inseminate the lot and then to mate them naturally.

The next point that I feel is of great importance to the turkey farmer is that artificial insemination can also be of great help in combatting the end of season drop in fertility. Directly this tailing off begins then we make a regular practice of artificially inseminating every 2 to 3 weeks. This regular handling has the added advantage that it also allows us to eliminate those birds that have ceased production. This is a most important point, because in my experience, hen turkeys quickly lose 1 to 2 pounds in body weight when they go out of lay.

The third point that I would put in favour of artificial insemination is that it does enable fertility to be kept in any birds that have to be removed from the pen for any reason. A stag may damage a hen by tearing the flesh in spite of the bird wearing a saddle. This bird has to be removed and if it has not healed within 10 days then we inseminate the hen and keep her apart. We find it is of no use returning a hen to be mated naturally once it has been torn until the wound really has healed, because otherwise the stag merely makes matters worse. Again, any birds that become pecked by other birds and have to be removed are also inseminated.

You will gather from what I have already said that I do not feel that artificial insemination will completely replace natural mating, but it is a very useful supplement. In my view, birds should always be naturally mated, with artificial insemination being brought into use whenever it appears to be beneficial.

I must say that we are very fortunate in Norfolk in having Ray Feltwell as our Poultry Advisory Officer and it is largely thanks to him that we have now developed a very simple, rapid and efficient means of artificial insemination of turkeys, that can be carried out with the minimum of disturbance to our breeding flocks. We call this the Feltwell technique and, although I know he would have liked to have been here today, he is at this very moment demonstrating his methods of artificial insemination to the colleens of Ireland.

Another really important item is that it is quite pointless to attempt artificial insemination unless you have the facilities for the job. I feel that all stags should be housed in individual pens. My pens are roughly a yard square with a hinged lid. This I regard as most important, the lid is raised and then, the stag can be lifted out quite gently. It is most surprising how tame these stags become after handling once or twice. Without the hinged lid, the turkeys would no doubt be grabbed by the legs and this will put them out of humour right at the start.

In the case of hens, we find it very much better to crate them up 5 or 10 minutes before we artificially inseminate, by which time they have settled down and we can take them out of the crates very carefully and return them to the pens. By crating I mean driving the birds very gently and carefully out of the pen into a special turkey catching crate. This avoids having to catch the birds when they are flying over one's head, for that is the sort of treatment that soon puts the birds out of production.

I feel I should mention the manner in which I normally mate my turkeys. In the individual pens 1 stag is with 10 to 12 hens. In the flock pens there are usually 30-40 hens in a group. However, only 1 stag is used at a time. This stag is in the pen for 2 complete days and is then replaced by one of the reserve stags. Altogether each pen has 4 stags, one in use and 3 in reserve. The four stags are, of course, of similar breeding. When it comes to artificial insemination, the stags that are not in the pen are used and it does not seem to matter whether they have been out of the actual pen for hours or days, for they usually seem to respond quite well.

Another point that I would like to make is that artificial insemination is not an excuse for poor or indifferent management. The biggest lift in fertility can always be obtained by good management and by good breeding, and artificial insemination can never be a substitute for these two points. I

cannot over-emphasise the importance of breeding and management, whether it be of chickens or of turkeys. This is a point that my father, Walter Bradbury, has always impressed upon me. He made the point in a paper that he read at the Harper Adams Conference in 1919, and the point is just as true today as it was then, just about 37 years ago.

To sum up, my view of artificial insemination is that it has a very definite place in the turkey industry and that the practice will grow. The value, however, must not be over-emphasized. Artificial insemination is not the answer to all cases of poor fertility and will never become a substitute for natural mating. It is of great help in clearing up early and late season infertility and also in keeping up fertility in the odd birds that have to be removed from the breeding pens for any reason other than disease.

POULTRY INDUSTRY DISTINGUISHED SERVICE AWARDS—1956

The General Secretary (Mr. John R. Harvey) of Poultry Association of Great Britain, announces that the Association has decided to make three distinguished service awards for the current year. They go to:

1. Dr. R. F. Gordon, M.R.C.V.S., for distinguished service over many years in the field of research into poultry diseases.
2. Mr. C. Hedderwick, O.B.E., for distinguished service over a long period of years in the sphere of poultry breeding.
3. Miss M. M. MacLeod, N.D.D., for distinguished services covering many years in the field of poultry advisory work. Particulars of the receivers of the Awards attached.

The Association initiated four years ago the presentation of not more than three awards each year for distinguished service over a long period of years in, or for, the poultry industry of the United Kingdom. The Award consists of a bronze medal and parchment citing the award.

Dr. Gordon graduated B.Sc. in pure science at Aberdeen University in 1930; thereafter he was awarded a Colonial Veterinary Research Scholarship which he held at the Royal

Veterinary College, London and qualified M.R.C.V.S. in 1933. He joined the Ministry of Agriculture's Veterinary Research staff at Weybridge in that year and eventually resigned his appointment there as Senior Research Officer in 1948. In 1946 Dr. Gordon was awarded a D.Sc. from Aberdeen University for a thesis on avian Salmonellosis and in the same year was a member of the poultry delegation which visited the United States. Since 1948 he has been Director of the Animal Health Trust Poultry Research Station—now of course the Houghton Poultry Research Station grant aided by the A.R.C. In addition, he is Technical Adviser on Poultry to the A.R.C. and Technical Secretary to the Poultry Committee of that body. He is at present President of the U.K. Branch of the W.P.S.A. and Vice-President of the W.P.S.A. He is interim President of the newly constituted Association of British Veterinary Poultry Pathologists; a member of the Examinations Committee of the National Poultry Diploma Board and Vice Chairman of the Technical Committee of the Chick Producers' Association. Dr. Gordon is a member of the Agricultural Improvement Council and Chairman of the Poultry Experiments Sub-Committee of the Agricultural Improvement Council. He is also an extamural lecturer at Cambridge University.

Mr. C. Hedderwick, O.B.E., has been an accredited poultry breeder for thirty years, and the owner of an accredited hatchery for twenty-one years. He secured in the early 1920's a college diploma in agriculture (Edinburgh) and for two-and-a-half years was Vice-Principal of the Somerset Farm Institute. For many yeas he has been a member of the Poultry Stock Improvement Advisory Committee of the Ministry of Agriculture and is Chairman of the Appeal Panel of that Committee. He was a Member of the Poultry Technical Committee 1937-1938 and in 1946 was a Member of the British Poultry Mission which visited Canada and the United States of America. Mr. Hedderwick was for twenty years Chairman of the Accredited Poultry Breeders' Federation and is now a Vice-President of that body.

Miss M. M. MacLeod studied poultry husbandry at the North and West Colleges of Agriculture (Scotland). After she had completed her training and had secured experience in poultry husbandry she held appointments under the Berkshire and Surrey County Councils. She returned to Scotland in 1926 to join the staff of the North of Scotland College as

County Instructess in poultry keeping and dairying in which capacity she worked on the mainland of Ross and Cromarty as well as in the Western Isles. In 1932 she was appointed by the Department of Agriculture for Scotland as Woman Inspector, a post whose scope steadily expanded until it reached the grade of Senior Inspector.

Miss MacLeod retires from the Department's service in June. During her career she has been associated with many organizations and committees connected with the Poultry Industry, including Membership of the National Poultry Board and the Council of the World's Poultry Science Association. She played an important and effective part in the organization of the World's Poultry Congress (1954) in Edinburgh as Technical Adviser and Chairman of the Tours Committee. (May 24, 1956)

THAT PINK COLOR IN POULTRY.

Pink color in well-done roasted poultry has caused many homemakers some concern. What's the significance of this pink color that may appear just under the skin?

Scientists at USDA's Western Utilization Research Laboratory found that pink color in thoroughly cooked poultry results from the same chemical reaction that causes redness in ham, and other smoked or otherwise cured meats. Quality is not affected.

The explanation is that any flame—of a gas oven burner, wood in a barbecue pit, or even the hot surface of some electric heating elements—produces minute quantities of gaseous carbon monoxide or nitric oxide, or both. These compounds, in normal and very small amounts, react with the small amount of hemoglobin that remains in the flesh of slaughtered, well-bled birds. The result is the familiar bright pink or red color.

Smoke used in preparation of cured meats will also give these effects, as will curing solutions that contain nitrate or nitrite salts—forms of the nitric oxide previously mentioned.

Extent and intensity of the color are influenced by the temperature of the flame or heater, the manner of roasting (that is, in covered roaster, wrapped in foil, or in an open pan for various periods), and the age and amounts of fat in the skin.

Agricultural Research—March, 1956
United States Department of Agriculture, Washington, D. C.

REVIEW OF POULTRY PUBLICATIONS

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GENETICS

COLE, R. K., and F. B. HUTT. (Cornell U., Ithaca, N. Y.)
PATERNITY FOLLOWING THE REPLACEMENT OF BREEDING COCKERELS. *Poultry Sci. 34(2):* 283-292.—The replacing of one male by another in the breeding pen results in doubtful paternity for a brief period. A test of the extent of possible errors in paternity was made when the following schedule is used. Four days after the removal of a breeding cockerel a second one is introduced late in the afternoon. Chicks from eggs laid the following day will have been sired by the first cockerel. Eggs for the next 5 or 6 days are discarded. Thereafter paternity is assumed to be that of the second cockerel. White Leghorn females were used and White Leghorn males replaced or were replaced by Houdans or other colored males. The actual sire of each subsequent chick was determined by inspection for Ii and K or, in the cases of the Houdan males, D, Po, and Ii. Among 45 such replacements of males, including Houdans in 34 exchanges, 28 had no errors in paternity and only 2 had errors in excess of 4%, when a total of 6 day's eggs were discarded and eggs for the subsequent 18 days were hatched. In one test of 12 exchanges, artificial insemination resulted in a more prompt replacement of the influence of the first sire but the sporadic occurrence of chicks sired by the first male persisted for about the same length of time as following natural matings. The highest error observed was 5.8% among 86 chicks hatched. This was due to the poor fertility of the replacing sire (58%) and all progeny were therefore discarded anyway. Multiple shifts or replacement of males will not cause errors in assignment of paternity sufficient to influence the progeny-test so long as appropriate schedules are followed and the replacing cockerels properly prepared before they are introduced into the breeding pens.—*R. K. Cole.* (Biological Abstracts)

COLES, R. (Min. Agric., Eng.)
SOME OBSERVATIONS ON BREEDING FOWL RESISTANT TO LYMPHOMATOSIS. *Poultry Sci. 34(2):* 312-322. 1955.—Principles involved in breeding fowl resistant to lymphomatosis are discussed with particular reference to the policy common among poultry breeders of breeding from hens. A brief account is given of an attempt to breed a flock of White Leghorns resistant to the disease, and attention drawn to the behavior of pullet dams remated as hens. In the earlier years of the experiment females remated as hens produced on the average a greater number of offspring in their 2nd years compared with their 1st year and a greater number of the hen-bred progeny succumbed to the disease. This did not happen in the later years of the experiment and it is concluded that if resistance is not strongly established females may fail to transmit resistance to their 2nd year offspring. As a consequence the advice to breeders to breed from hens is questioned unless either a high degree of resistance is already established or the challenge from the disease is low. It is also contended that the normally smaller 2nd generation family may give a false impression that some resistance has been secured by reason of the lessened chance of the disease to manifest itself. Attention is also drawn to a reduction in fertility and hatchability with those dams having offspring free from the disease compared with those dams in whose progeny losses from lymphomatosis occurred but no explanation for this is offered.—*R. Coles.* (Biological Abstracts)

COLLINS, W. M., S. C. THAYER, and W. C. SKOGLUND. (U. New Hampshire, Durham.)
BREED AND STRAIN DIFFERENCES IN SHANK PIGMENTATION IN GROWING CHICKENS. *Poultry Sci. 34(1):* 223-228. 1955.—Differences in the degree of yellow shank pigmentation in several strains of 10 week old New Hampshire and White Plymouth Rock chickens were studied in 3 consecutive trials of the 1953 New Hampshire Broiler Test. The shank color of New Hampshire was significantly darker than the shank color of White Plymouth Rocks. Within each breed significant strain and sex differences in shank color were observed. Degree of shank pigmentation was markedly influenced by the environment.—*Auth. summ.* (Biological Abstracts)

HAYS, F. A. (U. Massachusetts, Amherst.)
AGE OF PARENTS AND MORTALITY IN OFFSPRING. *Poultry Sci. 34(2):* 472-474. 1955.—Data include 94 sires mated to 577 dams to produce 9944 chicks tested for viability to 6 months and 86 sires mated to 266 dams to produce 2536 pullets tested for their first laying year, all Rhode Island Reds. Age of parents had no effect on mortality in offspring during either period. There was, however, a highly significant difference between sires in the viability of daughters in the laying house. Longevity in parents was no criterion of viability in their offspring in the growing period or during the first laying year.—*F. A. Hays.* (Biological Abstracts)

HAYS, F. A. (U. Massachusetts, Amherst.)
TESTING FOR OVER-DOMINANCE AND EPISTASIS. *Poultry Sci. 33(6):* 1105-1106. 1954.—Rhode Island Red pullets hatched in 9 generations were used for study. When groups of males were mated to females with different levels of egg production the mean production of the daughters tended to follow the level of the dams. Genetic variability in daughters from dams laying fewer eggs than the mean of the flock was 40.23 eggs compared with 34.64 eggs for daughters of dams laying more eggs than the mean of the flock. Lack of genetic variability was not pronounced in the high producers and the response as indicated by superior daughters from high-producing dams when the sire was constant suggests that over-dominance and epistasis are not prominent in this flock. Egg production showed a heritability of about 18%.—*F. A. Hays.* (Biological Abstracts)

HELDER, J. F. (State Poultry Institute, Beekbergen, the Netherlands.)
OVER DE NAWERKING VAN DE BEVRUCHTING NA HET VERVANGEN VAN DE HAAN. [SOME OBSERVATIONS ON THE PERSISTENCY OF FERTILIZATION AFTER ONE MALE IS REPLACED BY ANOTHER.] *Mededeling 60,* Rijksinstituut voor Pluimveeteelt, Beekbergen. Eng. Summ. 1955.—Author investigated, on a small scale, the suitability of Prof. Hutt's nine-day interim method for progeny testing of cocks for practical breeding purposes, recommended in "Genetics of the fowl." Artificial insemination was not applied. Eggs were hatched of the cross White Leghorn sire x North Holland Blue dam and of the reciprocal cross. To this end the White Leghorn sires in the White Leghorn pens were replaced by North Holland Blue sires; the North Holland Blue sires in the North Holland Blue pens by White Leghorn sires. The cocks rotated every three days in groups of three. It appeared that in the cross North Holland Blue male x White Leghorn pullet the influence of the sires of the same breed was still present after 15 days, in case of the reciprocal cross after 16 days. In a second experiment with North Holland Blue pullets the males of the same breed were removed in the morning, the White Leghorn cocks being placed in the afternoon of the same day. After 17 days the White Leghorn males were removed again, the North Holland Blue males being replaced two days after this removal. In one case a Blue chick was even hatched on the 20th day after removal of the Blue cocks. In the course of the various investigations 25%, 67% and 23% of pure bred chicks were obtained from eggs gathered on the 10th day after removal of the

males of the same breed as the pullets. In these experiments no relation could be found between the duration of the influence of the first male and the fertilization of the second male. Prof. Hutt has lately recommended not to place the second male until the afternoon of the 4th day and not to save eggs for incubation until the 12th day after removal of the first male. Author's experiments indicate that in certain cases it may be preferable that a period of more than 12 days has elapsed after removal of the first male, before eggs are being saved for incubation. Author's experiences may be considered to be in agreement with the general practice in the Netherlands, not to save eggs for incubation until 2-3 weeks after replacing the cock.—*Author.*

HUTT, F. B., and R. K. COLE. (Cornell U., Ithaca, N. Y.)
MULTIPLE SHIFTS FOR TESTING COCKERELS. *Poultry Sci. 34(2):* 271-283. 1955.—A method is described by which 3 cockerels are tested each season in every pen utilized for cockerel tests. After removal of the males of Shift I, eggs are credited to them for 5 days. Replacing males of Shift II go in the pens late on the 4th day. Eggs are not credited to them until 8 days after their introduction, which is 12 days after removal of Shift I. Thus eggs are discarded for 6 days. Prior to adoption of multiple shifts in 1942, among 70 cockerels tested in one strain of White Leghorns by single-male matings, wastage to January 1, was 36%, and 40% of those then available were used as proven sires. In the first 10 years of multiple shifts, among 172 cockerels tested in the same strain, wastage to January 1, was 34%, and only 24% of those still available, (16% of those started on test) were used as proven sires. In the 5 years before multiple shifts were begun, improvement in viability and productivity was practically nil. With multiple shifts, progress was resumed and has been continued over an 11-year period. This is attributed chiefly to the increase in selection pressure made possible by testing annually two or three times the number of cockerels previously tested. Methods for evaluating sires tested in 3 successive shifts are given. One advantage of multiple shifts is that for cockerels used in Shifts II and III, their partial sister-tests are lengthened by 1 and 2 months, respectively, over the test period available when cockerels of Shift I are selected. Examples are given to show how the testing of females in diallel matings with 3 successive sires permits a better appraisal than is possible with hens mated only to a single male. Various criticisms of multiple shifts are refuted and, after 12-years' experience with it, the system is recommended to other poultry breeders.—*F. B. Hutt.* (Biological Abstracts)

JAAP, R. GEORGE. (Ohio State U., Columbus.)
SHANK COLOR AND BARRED PLUMAGE IN COLUMBIAN-COLORED CHICKENS. *Poultry Sci. 34(2):* 389-395. 1955.—Four different breed strains of columbian-colored chickens were used to study the association between presence of barred plumage color and paleness of yellow as well as intensity of greenish color in the shanks. This association is attributed to the barring gene (B) in columbian (See) plumage color phenotypes together with the inhibitor of dermal melanin (Id) in the shanks. The gene frequency of B in the Delaware breed was found to be 0.64 instead of 1.0. Antagonistic selection for whiter plumage (B) and yellower shanks (b+) is given as the reason for more than 40% of the Delaware males being heterozygous at the B-locus. The data demonstrate additional unknown genetic and environmental effects on shank coloration. The incidence of bluish or greenish coloration in the inner layers of the abdominal wall was found to be less frequent in nonbarred columbian crossbred males at 10 weeks of age.—*R. G. Jaap.* (Biological Abstracts)

LERNER, I. MICHAEL. (U. California, Berkeley.)
GENETICS AND POULTRY IMPROVEMENT. *World's Poultry Sci. Jour. 10(3):* 228-239. 1954.—A review. The development of population genetics and statistics permitting predictable effectiveness of various approaches to breeding problems has led to recognition of

superiority of mass selection for improvement in egg size, of sister testing for high egg production, the advantage of pullet over hen breeding, or partial trapnesting and other limited sampling techniques, crossbreeding improvements and emphasis of economic traits instead of artificial standards for commercial breeds. The intentional introduction of physiologic stress is being developed to study developmental homeostasis. Cooperative interdisciplinary efforts are required.—*J. B. Christiansen.* (Biological Abstracts)

RAGAB, M. T., A. A. ASKER, and M. K. ELDINE. (Fac. Agric., Cairo U., Egypt.)
GRADING BALADI FOWLS WITH WHITE LEGHORNS. *Poultry Sci. 34(2):* 323-326. 1955.—Egyptian Baladi fowls were graded with White Leghorns to study the influence of this procedure on body weight, mortality rate and hatchability of eggs. The F_1 graded Baladi surpassed all groups (Baladi, Leghorn and 3/4 Leghorn) in weight after the second week of age. Mortality rate of graded Leghorns (½, ¾, ⅞) was 57.5% compared to 66.7% for Leghorns and 38% for the Baladi. Hatchability for the ½ Leghorn was more than that of either Baladi and Leghorns. The hatchability for the ¾ Leghorn was lower than that for the ½ Leghorn and the ⅞ Leghorn was lowest in hatchability. The hatchability decreased as the percentage of Leghorn blood increased. Breeding pure Leghorns under Egyptian environment caused decline in hatchability year after year. *M. T. Ragab.* (Biological Abstracts)

VAN ALBADA, M. (State Poultry Institute, Beekbergen, the Netherlands.)
ON THE SIGNIFICANCE OF SOME CHARACTERISTICS OF EGG PRODUCTION IN BREEDING UTILITY BREEDS OF POULTRY. *Netherlands Journal of Agricultural Science. 3:* 135-154. 1955.—A statistical investigation was instituted among White Leghorn chickens, to examine the correlations between some characteristics of egg production, and again between them and total production in the first production year. This investigation concerned successively a random sample from a specific breeding establishment and the entire White Leghorn breeding stock of the State Poultry Institute for the years 1947 to 1952. The investigation showed that productivity as a whole was influenced considerably not only by the length of the production year (and this, in particular, in so far as it was dependent on the age at which laying ceased), but also by the average length of the laying cycle. In addition to the interrelation of the various production characteristics, their heritability, and consequently their significance in breeding for egg production, were also studied with reference to the Institute's White Leghorn stock, already referred to. In this connection, it was found that selection of the dams for the characteristics of age at first egg, age at last egg, and average length of laying cycle (even when the last-mentioned factor was measured only in the first two months of production) was bound to be considerably more effective in the case of this material than selection for egg production, expressed in numbers of eggs or weight of eggs in kg, over a period extending to 1st February or 1st October of the year following year of birth. As regards the practical side of trapnesting, it follows from this that, if it is desired to apply a partial check during the first laying year, a daily check throughout some months at commencement of production, followed by checking on a limited number of days per week throughout the rest of the year, is greatly to be preferred to intermittent trapnesting carried on indefinitely. In statistical treatment of the data, indications were obtained to the effect that, when selective mating is applied—as was done in breeding from the stock described, and as will frequently occur in breeding practice—a variance analysis is not a reliable method to use in the selection work, owing to the fact that such mating has a levelling influence on hereditary variance.—*Author.*

VAN ALBADA, M. (State Poultry Institute, Beekbergen, the Netherlands.)
KRUISINGSPROEF MET WITTE LEGHORNS EN NOORDHOLLANDSE BLAUWEN. [CROSSBREEDING EXPERIMENT WITH WHITE LEGHORN AND NORTH HOLLAND BLUES]. *Mededeling*

59, Rijksinstituut voor Pluimveeteelt, Beekbergen. Illus.; Engl. summ. 1955.—An experiment has been made to establish the combining ability of the Institute's strains of White Leghorn and North Holland Blue. The crossing between the strains was performed reciprocally. As controls purebred birds of like descent were used. In total 892 female chicks and 540 pullets, sired by 2 x 24 sires with 2 x 200 dams, were placed in the pens. Hatching results showed fertilization to be less in crosses than in pure breeds. The hatchability of the fertile eggs showed only little heterosis. From the rearing results it followed that dams as well as sires influence the chicken mortality. At ten weeks the crossbreds had about the same weight as the North Holland Blues, but at 14 weeks they weighed ca.150 gms. less. On the whole the White Leghorns consumed a little more food per g gain in body weight, the North Holland Blues used somewhat less crude protein per g weight-gain than the other groups. The North Holland Blues showed the largest number of losses among the laying birds. Mated to the same sires the North Holland Blue dams produced more losses among their daughters than the White Leghorn dams. The same holds good for the frequency of the leucosis complex and coccidiosis. Birds with eversion of the oviduct were observed only in the pure breeds, especially in the North Holland Blues. Besides these 9 cases of "blowout," there was a rather frequent appearance of cannibalism among the North Holland Blues (vent-picking) which was probably provoked by prolapse. These cases are included in the total losses. With regard to egg production a manifest heterosis could be observed, especially in the winter months. Body weight was inherited intermediary. In spite of higher body weight, feed consumption per kgm. eggs was somewhat lower in White Leghorn x North Holland Blue crossbreds than in White Leghorns; in the North Holland Blue x White Leghorn crossbreds however it rated somewhat higher. On the whole White Leghorn x North Holland Blue crossbreds gave somewhat better results than the reciprocal crossbreds, because of earlier feathering, less broodiness and lower feed consumption per kgm. eggs.—*Author.*

PHYSIOLOGY

ADAMS, J. L. (U. Wisconsin, Madison.)
PROGESTERONE-INDUCED UNSEASONABLE MOLT IN SINGLE COMB WHITE LEGHORN PULLETS. *Poultry Sci. 34(3):* 702-707. 1955.—Crystalline progesterone dissolved in propylene glycol was injected into pullets dyed in a 5:1 aqueous dilution of a commercial ink (Parker's Royal Blue Quink). Two periods of treatment were used, 26 mg/week (as 2 injections of 13 at 3.5 day intervals) for 9½ weeks and the same regimen for 5.5 weeks with a terminal dose of 40 mg. A rapid molt was produced by both periods of progesterone administration but in both cases molting ceased about 2 weeks after the final injection. Egg production ceased immediately after injection of progesterone was begun in almost all cases. Pullets returned to production in 25 days (±2.6 days) after last injection. Sexual behavior was affected by progesterone by elimination of the squatting behavior normally exhibited by laying hens within one week after the beginning of treatment. Body weight was slightly affected in that treated pullets failed to gain weight during the months when the controls increased their weight. After the progesterone was discontinued the treated birds increased their weight to the level of the controls.—*J. L. Adams.* (Biological Abstracts)

ADAMS, JOHN L., and RAYMOND B. HERRICK. (U. Wisconsin, Madison.)
INTERACTIONS OF THE GONADAL HORMONES IN THE CHICKEN. *Poultry Sci. 34(1):* 117-121. 1955.—Three hormones, progesterone, testosterone, and diethylstilbestrol were tested for effects and interactions using young chickens. Dosages ranged from 15 mg implanted as a pellet to 2 mg injected subcutaneously twice weekly. Males, females, and capons were studied in experiments of 5 and 6 weeks duration. Criteria of effect included growth, oviduct, comb and testes weights,

and female mating behavior. Growth rate was depressed in males by diethylstilbestrol + testosterone and by testosterone + progesterone. Diethylstilbestrol + testosterone improved growth in capons and no growth effects were observed in females. A synergistic interaction between diethylstilbestrol and testosterone and between diethylstilbestrol and progesterone was shown in oviduct weights of females. No significant evidence of hormone interaction in comb weights of females was found but interactions of an antagonistic nature occurred between testosterone and diethylstilbestrol in the comb weight of males. No significant hormonal effects on testes weights were observed at the levels of hormone used. Progesterone augments the effect of diethylstilbestrol on female mating behavior while having no effect alone. Testosterone inhibits the female behavior alone or in combination with diethylstilbestrol.—*J. L. Adams.* (Biological Abstracts)

BAINTER, K., and J. BOGRE.
THE IMPORTANCE OF THE GERMINAL DISC EXAMINATION AND ITS PRACTICAL APPLIANCE. [A CSIRAKORONG VIZSGALAT JELENTCSEGE ES GYAKORLATI ALKALMAZASA]. *Baromfiipar,* Budapest, 1955, July-August, pp. 10-17.—The fertility of eggs can already be stated within 12 to 24 hours of hatching by an egg-transilluminating lamp of a new system. With the help of this transillumination lamp experiments were carried out in three groups to select unfertile eggs and to study the relation between the size of the germinal disc and the viability of the chick embryo. Based on the germinal disc examinations made during the first 24 hours of hatching, counted from the time of placing the eggs in the incubator on an average 70 per cent of the eggs qualified as unfertile proved to be unfertile also after six days. The eggs placed in incubators were ranged in classes according to the size on the germinal disc, and the death- and hatching-rate of the various groups was examined.

From the results of experiments it can be concluded that in case of eggs the germinal disc of which was smaller than 5 mm after 24 hours preliminary hatching the proportional death rate of the embryos was greater and less chicks hatched.

Contrary to the eggs of uncertain and small germinal disc, eggs of medium and large germinal disc attained a 15 to 20 per cent better hatching percentage. From a hatching point of view, only eggs of a germinal disc of at least 5 mm, after a preliminary hatching of 24 hours are suitable. (Hungarian Agricultural Review)

DULIN, WILLIAM E. (Indiana U., Bloomington.)
THE EFFECTS OF CORTISONE ON THE WHITE LEGHORN COCKEREL AND CAPON. *Poultry Science 34(1):* 73-77. 1955.—The effects of cortisone on the White Leghorn cockerel and capon were studied. It was observed that body growth of the capons, but not cockerels, was decreased with this hormone. There also resulted an inhibition of testes growth and comb growth in the intact birds, but an increased comb growth in the capon. It was noted that cortisone treatment for 20 days did not produce any adrenal atrophy, although it was capable of inhibiting adrenal enlargement produced by epinephrine.—*W. E. Dulin.* (Biological Abstracts)

ERICSON, A. T., R. E. CLEGG, and R. E. HEIN. (Kansas State Coll., Manhattan, Kansas.)
INFLUENCE OF CALCIUM ON MOBILITY OF THE ELECTROPHORETIC COMPONENTS OF CHICKEN BLOOD SERUMS. *Science 122(3161):* 199-200. Illus. 1955. (Biological Abstracts)

FOX, THOMAS W. (U. Massachusetts, Amherst.)
EFFECTS OF PROGESTERONE ON GROWTH AND SEXUAL DEVELOPMENT OF S. C. WHITE LEGHORNS. *Poultry Sci. 34(3):* 598-602. 1955.—Weekly intramuscular injections of 2, 4, 8 and 16 mg of crystalline progesterone dissolved in sesame oil had no significant effect on mean 12-week body weight or shank length of male or female White

Leghorn chickens. Progesterone did increase variability of body weight and shank length, decreased testis and comb size in males and delayed sexual maturity in females.—*T. W. Fox.* (Biological Abstracts)

GODFREY, GEORGE F., and C. WILLIAMS. (Oklahoma Agric. Expt. Sta., Stillwater.)

UNSUITABILITY OF THE CHICK WEIGHT: EGG WEIGHT RATIO AS AN INDICATOR OF POST-NATAL GROWTH. *Poultry Sci. 34(1):* 164-166. 1955.—The percent the day-old chick was of the original egg weight was determined in chicks, and used in an attempt to predict body weights at 12 weeks of age. Although the correlation coefficients were significant, only about 5% of the total variation could be accounted for by the percent the day-old chick was of the original egg weight.—*Auth. summ.* (Biological Abstracts)

HAFEZ, E. S. E., A. L. BADRELDIN, and G. A. R. KAMAR. (Fac. Agric., Cairo U., Egypt.)

EGG COMPONENTS IN THE FAYOMI FOWL DURING THE FIRST LAYING YEAR. *Poultry Sci. 34(2):* 400-410. Illus. 1955.—The experiments included 50 domestic pullets of Fayomi breed. During the 1st year of laying, 6663 eggs were dissected into albumen, yolk and shell. The 1st egg weighed 27.8 g followed by a gradual increase throughout the experimental period. The relative increment of weight increase was always declining. In the 1st 5 eggs the albumen, yolk and shell were 58%, 29% and 13% of egg weight, respectively. Yolk percent increased while albumen percent decreased and shell percent was almost constant. Egg weight was correlated with egg components. The weights of albumen, yolk and shell were also correlated. All correlations were positive and highly significant. High variability was observed in egg weight and its components, this was very pronounced at the 1st eggs laid. In general, yolk percent of the Fayomi breed is higher than that in other breeds, while the actual weight of yolk is similar to that of other breeds.—*Authors.* (Biological Abstracts)

HENDERSON, E. W. (Michigan State Coll. Agric. Expt. Sta.)

INHERITANCE OF EGG WEIGHT AMONG PARENTS AND PROGENY OF A DARK CORNISH-WHITE LEGHORN RECIPROCAL CROSS. *Michigan State Coll. Agric. Expt. Sta., Quart. Bull. 36(4):* 462-468. Illus. 1954.—Spring egg weights of Dark Cornish-While Leghorn reciprocally cross bred pullet progenies were compared statistically with parental populations. Average egg weight of the populations was as follows: (1) Dark Cornish—51 g (S. D. 3.9) (2) White Leghorn—57 g (S. D. 4.1) (3) F_1 Reciprocal cross bred progeny—55 g (S. D. 4.8) (4) W. L. x D. C. 54.8 g D. C. x W. L. 54.9 g. There was no significant difference between the mean egg weights of the reciprocal F_1 populations. Egg weight was not dominant, sex-linked, nor matroclinous. Heterosis was not evident. The superior value of the use of the standard deviation as a guide in selection practice over the population average alone was demonstrated.—*Auth. concl.* (Biological Abstracts)

JAAP, R. GEORGE. (Ohio State U., Columbus.)

SAMPLING BODY WEIGHT OF GROWING CHICKENS. *Poultry Sci. 34(2):* 396-397. 1955.—Using a maximum variance of 0.10 for males and 0.07 for females at 8 weeks, about 70 cockerels, 50 pullets or 90 non-sexed chickens are needed to obtain a random sample to predict average weight of a flock within 0.1 lb. A method for obtaining random samples is described. Comparisons of averages obtained from sample weights and actual weights are given in the tables.—*R. G. Jaap.* (Biological Abstracts)

KRIZENECKY, J., J. SAJNER, V. OREL and F. MUSIL.

DETECTION OF FERTILIZED, INFERTILE AND NONFERTILIZED EGGS IN BIOLOGICAL CONTROL OF INCUBATION, AND TESTING OF COMMERCIAL EGGS. *Ministerstvo Potravinarskeho Prumyslu.* Praha, Checoslavskia 1955. 113 pp.

The results proved again the well-known fact that the cicatricules (blastodiscs) in nonfertilized eggs, i.e. in eggs of hens without a cock, are characterized by the presence of vacuolic lacunes of different size and number on their surface which may sometimes make the entire disk foamy.

The cicatricules (blastodiscs) of fertilized eggs on the contrary are round with a uniform smooth, clearly designed surface without any lacunes. They are fully developed i.e. the germ has reached the gastrula.

The results may be summarized as follows: "Clear" eggs determined at the first candling comprise these kinds of eggs: (1) nonfertilized eggs (2) fertilized eggs with dead blastodiscs (3) eggs in which the fully developed germ (cicatricule) died after the eggs have been laid (4) fertilized eggs in which the development started at the beginning of incubation but where the germ perished at an earlier stage of development before the peripheric blood circulation had been formed and therefore could not be detected by the ordinary candling method.

One third of the eggs eliminated at the first candling as "clear" were in reality fertilized eggs in which the disc either died before being put into the incubator or the development has been interrupted in the first stages.

Another practical use of the results of this work is that they form a basis for the right and reliable determination of fertilized commercial "extra grade quality eggs."

The bulletin includes complete descriptions and illustrations of the different types of eggs, as produced under different conditions.

McKINLEY, W. P., H. GRICE, and M. R. E. CONNELL.
THE DEMONSTRATION OF ACETYL PHOSPHATIDE (PLASMALOGEN) IN THE DEPOT FAT OF FOWL TREATED WITH DIETHYLSTILBESTROL. *Canadian Jour. Biochem. and Physiol. 33(3).* 317-322. 1955.—The abdominal depot fat from young cockerels, male castrate fowl, or male turkeys which were treated with diethystilbestrol, or from hens in egg production, contains a material which responds to the Feulgen plasmalogen test. After treatment with $HgCl_2$ under specified conditions, fat from such birds reacts with fuchsin-sulfurous acid to give a purple colored product. The material responsible is considered to be plasmalogen. Fat from corresponding regions of non-laying hens, cockerels and male turkeys of varying ages, and castrated males does not give the reaction when it is performed under the specified conditions. A technique based on these findings is described and has been used to distinguish chickens or turkeys which have been treated with estrogen from birds which have not been thus treated.—*Auth. abst.* (Biological Abstracts)

ROMIJN, C., and W. LOKHORST. (State U., Utrecht, Netherlands.)
CHEMICAL HEAT REGULATION IN THE CHICK EMBRYO. *Poultry Sci. 34(3):* 649-654. 1955.—A technique was described for continuous recording of the respiratory metabolism and the temperature of the incubated egg. The chicken embryo shows a poikilothermic reaction to changes in environmental temperature till the moment of hatching. In the full term embryo there are certain indications of developing homeothermia nl. a considerable rise of the R. Q. during cooling over at least 10 centigrades. In the newly hatched chicken the body temperature shows only small fluctuations after cooling or heating over 3 centigrades owing to the homeothermic reaction of the heat production. In the 7 days old chicken, the constancy of body temperature is much better established, even at changes in environmental temperature of 10 centigrades.—*C. Romijn.* (Biological Abstracts)

WILSON, WILBUR O., and ALLEN WOODARD. (U. California, Davis.)
SOME FACTORS AFFECTING BODY TEMPERATURE OF TURKEYS. *Poultry Sci. 34(2):* 369-370. 1955.—Effects of air temperature, plumage color, amount of shade and sex on body temperature of turkeys was studied. Air temperatures above 90°F caused hyperthermy in turkeys. White turkeys had slightly lower body temperatures than bronze. The amount of shade provided in the pens influenced body temperature only when air temperatures exceeded 90°F. The two sexes had approximately the same body temperature.—*W. O. Wilson.* (Biological Abstracts)

NUTRITION

BALLOUN, S. L. (Dept. Poultry Husbandry, Iowa State Coll., Ames.)
THE EFFECT OF QUARTERNARY AMMONIUM DERIVATIVES IN CHICK DIETS. *Poultry Sci. 34(1):* 191-196. 1955.—Dietary additions of 4 alkyl quaternary ammonium compounds consistently improved feed conversion in chicks raised to market weight. Growth was consistently improved in an "old" environment but seldom was improved in a "new" environment. There was a tendency for the growth improvement to occur only during the later phase of the growing period.—*Author.* (Biological Abstracts)

BRIGGS, G. M. (Natl. Insts. Health, Bethesda, Md.), **and M. R. SPIVEY FOX.**
COMPARISON OF VITAMIN B_{12} AND DESDIMETHYL B_{12} ACTIVITY IN THE CHICK. *Proc. Soc. Exptl. Biol. and Med. 89(2):* 318-319. 1955.—Desdimethyl B_{12} had only 9% of the activity of vitamin B_{12} in stimulating growth of chicks fed a vitamin B_{12}-low, corn-soybean diet containing 20% of lard.—*Authors.* (Biological Abstracts)

CERCOS, AUGUSTO P.
EFECTO DE LA PENICILINA G Y OTROS ANTIBIOTICOS SOBRE EL CRECIMIENTO DE POLLOS DE RAZA LEGHORN BLANCA CRIADOS EN BATERIA. [EFFECT OF PENICILLIN G AND OTHER ANTIBIOTICS ON THE GROWTH OF WHITE LEGHORN CHICKENS RAISED IN A BROODER.] *Rev. Invest. Agric. 9(1):* 5-22. Illus. 1955.—When penicillin G was given as a supplement to the feed of chicks to 10 weeks of age growth was increased 10-12%, compared with controls. The effect of penicillin is shown clearly when 0.25 mg of antibiotic/kg were used, and good effects were obtained with amounts of 0.5-20 mg/kg. The increase in weight is noticeable by the end of the first week. Other antibiotics, in similar amounts and under similar conditions, gave negative results. Penicillin absorbed by activated C showed stimulating effects similar to those from the untreated antibiotic. (Biological Abstracts)

COOLEY, M. L. (General Mills, Inc., Minneapolis, Minn.)
PROGRESS IN FEED QUALITY CONTROL. *Trans. Amer. Assoc. Cereal Chemists 12(3):* 285-291. 1954.—Some of the aspects of progress in feed quality control are discussed. Control procedures are described for common nutritional factors, mineral elements, vitamins, drugs, and antibiotics in feeds. Future developments and improvements in animal and poultry feeds, if they keep pace with those of recent years, will require an extension of quality control testing.—*Author.* (Biological Abstracts)

DONOVAN, G. A., E. L. JOHNSON, S. L. BALLOUN, and R. E. PHILLIPS. (Iowa State Coll., Ames.)
THE LONG RANGE EFFECT OF LOW LEVEL METHIONINE SUPPLEMENTATION IN GROWING TURKEY RATIONS. *Poultry Sci. 34(2):* 251-256. 1955.—Turkey poults raised to 24 weeks of age showed a small but consistent growth and feed conversion response to added synthetic DL methionine when fed a basal all-mash practical diet. With a free-choice method of feeding added methionine produced no observable effect. It was concluded that this difference was because the poults fed free-choice consumed a greater proportion of mash than anticipated and thus obtained ample natural methionine.—*Auth. summ.* (Biological Abstracts)

DYMSZA, HENRY, R. V. BOUCHER, and M. G. McCARTNEY. (Pennsylvania State U., University Park.)
THE INFLUENCE OF FIBER CONTENT ON PHYSICAL FORM OF THE DIET AND ENERGY REQUIREMENTS OF TURKEYS. I. STUDIES WITH TURKEY POULTS. *Poultry Sci. 34(2):* 435-439. 1955.—Turkey poults were fed diets in the form of mash or

crumbles that contained 5, 10 and 15% fiber. The calculated productive energy content of the diets was 744, 539 and 341 calories/lb., respectively. The 8-week weights were directly related to dietary energy levels. Diets in the form of crumbles gave weight increases of 2 to 58% over the weight of poults fed the same diets as mash. The use of crumbles proved to be a practical means of concentrating nutrients and counteracting some of the adverse effects of low levels of energy. Efficiency of feed utilization was directly related to the productive energy content of the diet and was, therefore, superior with the highest energy diets.—*M. G. McCartney.* (Biological Abstracts)

DYMSZA, HENRY, R. V. BOUCHER, and M. G. McCARTNEY. (Pennsylvania State U., University Park.)
INFLUENCE OF DIETARY FIBER AND ENERGY LEVELS ON REPRODUCTIVE PERFORMANCE OF TURKEY POULTS. *Poultry Sci. 33(6):* 1159-1163. Illus. 1954.—Four groups of selected White Holland turkey pullets were fed pelleted diets that contained 5, 10, 15 and 20% fiber supplied principally by ground oat hulls added at levels of 6.5, 23.8, 40.8 and 58%, respectively. The calculated productive energy of the diets was 882, 670, 460 and 249 calories/lb., respectively. Egg production, fertility and body weight maintenance were similar on all of the diets. Hatchability of all eggs and of fertile eggs appeared to be directly related to energy level and inversely related to fiber content of the diets. Significant differences in hatchability were found between all eggs set from the pullets on the 20% fiber diet (249 calories/lb.) and from the pullets on any of the other 3 diets. These differences were highly significant when only the fertile eggs were considered. Efficiency of feed utilization, as measured by lbs. of feed consumed per dozen eggs, was progressively better as the dietary energy level and total caloric intake were higher. The highest energy diet, which contained 882 calories/lb., resulted in the best reproductive performance by turkey pullets.—*Auth. summ.* (Biological Abstracts)

DYMSZA, HENRY, R. V. BOUCHER, and M. G. McCARTNEY. (Pennsylvania State U., University Park.)
INVESTIGATION OF CRUDE FIBER DIGESTION IN 12-WEEK-OLD TURKEYS. *Poultry Sci. 34(1):* 240-242. 1955.—A 5-day crude fiber digestion trial was carried out on 12-week-old White Holland turkeys. The practical type experimental diets composed of commonly used ingredients contained calculated crude fiber contents of 5, 10 and 15%. The added fiber was in the form of pulverized oat hulls. Digestion coefficients were calculated from intake and output data for crude fiber on a dry matter basis. Digestion coefficients were low, varying only from 0.4% to 3.9%, and followed no consistent pattern attributable to dietary fiber level or sex. It was concluded that digestion of crude fiber by turkeys was negligible.—*R. V. Boucher.* (Biological Abstracts)

FRANSEN, J. M., F. N. ANDREWS, and C. W. CARRICK. (Purdue U., Lafayette, Ind.)
THE EFFECT OF PLANE OF NUTRITION ON GROWTH AND SEXUAL DEVELOPMENT OF BARRED PLYMOUTH ROCK COCKERELS. *Poultry Sci. 34(1):* 205-209. 1955.—Effects of plane of nutrition on growth rate and on testis development and comb weight were studied in Barred Plymouth Rock cockerels from hatching until 10 weeks of age. A ration used at Purdue in 1937 was compared with one believed to be nutritionally superior according to 1952 standards for growth and efficiency. Males (300) were assigned to each ration. Fifteen males from each ration were killed at 2, 4, 6, 8, 9 and 10 weeks of age. Rate of growth was significantly greater on the 1952 ration throughout the 10 week period. Testis weight was significantly greater on the 1952 ration during the first 6 weeks but at 10 weeks the difference was not statistically significant. Comb weight on the 1952 ration was greater throughout the experiment. Differences were significant during the first 6 weeks but of doubtful significance at 10 weeks. At 4 and 6 weeks of age seminiferous tubule diameter was significantly greater on

the 1952 ration and stage of spermatogenesis was more advanced. At 8 and 10 weeks of age, testis histology was rather similar on the two rations. At 10 weeks of age 60% of all males, on both rations, exhibited spermatids, sperm heads or spermatozoa.—*F. N. Andrews.* (Biological Abstracts)

HALVERSON, A. W. (S. Dakota State Coll., College Station), **and C. M. HENDRICK.**

EFFECT OF TRACE MINERALS AND OTHER DIETARY INGREDIENTS UPON VITAMIN A STABILITY IN STORED POULTRY DIETS. *Poultry Sci. 34(2):* 355-360. 1955.—Vitamin A losses were compared by chemical analysis in diets supplemented with several vitamin A sources following storage for 30 and 150 days at 37°C. Losses were slight at 30 days with all supplements. At 150 days losses amounted to about 50% with cod liver oil (I) or a commercial dry fat product (II) and to about 20% with a commercial wax pellet product (III). The losses appeared unaffected by cereal ingredients used in different diets or by addition of meat scraps, limestone and Mn salt. Further addition of Fe, Cu and Co salts increased losses significantly with I and II at 30 and 150 days but only slightly with III even at 150 days. A higher trace mineral level increased losses to a greater extent.—*A. W. Halverson.* (Biological Abstracts)

JUCKER, H. (Swiss Federal Institute of Technology Animal Feeding Institute.)

DIE WIRKUNG ABGESTUFTER VITAMIN B_{12}—UND ANTIBIOTIKA-ZULAGEN AUF WACHSTUM UND FUTTERVERWERTUNG, GEPRUFT AN RATTEN UND KUCKEN. [EFFECT OF GRADUATED VITAMIN B_{12} AND ANTIBIOTIC SUPPLEMENTS ON GROWTH AND FEED EFFICIENCY IN RATS AND CHICKS.]

In experiments with rats and chicks different amounts of vitamin B_{12} and Terramycin were added alone and in combination to basal diets with or without animal protein.

Rats kept on a diet containing animal protein improved significantly their weight when fed higher levels of vitamin B_{12} (40 mcg/per kg feed) and/or Terramycin (30 mg per kg feed), while those kept on a vegetable diet improved their weight already with lower additions (20 mcg vitamin B_{12} and/or 15 mg Terramycin per kg). A beneficial effect on feed efficiency was observed only with vitamin B_{12} supplements to a vegetable diet. Their was no interaction between vitamin B_{12} and Terramycin.

With chicks, significantly increased weight gains resulted only either with a supplement of 40 mcg vitamin B_{12} or with 15 mg Terramycin per kg of animal protein diet. Feed efficiency was not significantly changed. (Author's summary)

JUKES, H. G., D. C. HILL, and H. D. BRANION. (Ontario Agric. Coll., Guelph, Ontario, Canada.)

EFFECT OF PENICILLIN ON THE GROWTH OF PHEASANTS. *Poultry Sci. 34(1):* 235-236. 1955.—Addition of 10 ppm of procaine penicillin to the ration of growing pheasants improved the average weight at 4 weeks about 13% over that of the controls. Feed efficiency of the antibiotic-fed group was also improved.—*H. Branion.* (Biological Abstracts)

JUKES, THOMAS H. (Lederle Labs., Pearl River, N. Y.)

THE ADVANCE OF POULTRY NUTRITION. *World's Poultry Sci. Jour. 10(3):* 240-251. 1954.—This reviews 1951-1954. Antibiotic growth response results from qualitative bacterial changes. Antibiotics may reduce requirements for thiamine, riboflavine, niacin, folic acid, biotin and vits. A and D, and protect against some deficiency symptoms. Chronic respiratory disease, non-specific mortality, and culls are reduced by Aureomycin. Egg production and hatchability are generally unaffected except in case of complicating vitamin B_{12} deficiency or

chronic respiratory disease. Four antioxidants are effective against nutritional encephalomalacia.—*J. B. Christiansen.* (Biological Abstracts)

KALLAI, L.

OUR POSSIBILITIES FOR IMPROVING THE BIOLOGICAL VALUE OF FOOD PROTEIN. [UJABB LEHETOSEGEINK A TAKARMANYFEHERJE BIOLOGIAI ERTEKENEK MEGJAVITASARA] A Magyar Tudomanyos Akademia Agrartudomanyok Osztalyanak Kozlemenyei. Budapest, 1955. 3-4, pp. 383-397.

An examination was made with the object of establishing the daily cobalamin requirements given orally of pigs and poultry of various age and different types of production under average Hungarian feeding conditions. From the obtained results it appears that the cobalamin requirements of younger animals, converted into live weight kilogram, is considerably more than that of animals of advanced age and that poultry, based on body weight kilogram, require more vitamin B_{12} than pigs. It was established that under Hungarian conditions the generally given food shows a shortage of cobalamin. If, however, the optimal vitamin level required by the animal's organism is in an adequate measure contained in the natural food, then it is unnecessary to supplement this by administrating vitamin B_{12}.

Together with his collaborators author worked out a method by which a cheap medium available in unlimited quantities, a cobalamin containing preparation, suitable for the completion of food rations can be made in large quantities by way of fermentation. This product was examined in serial experiments during 16 months on 17,599 animals. The plusproduction attained through the administration of vitamin B_{12} preparations fluctuated between 0-20%, 6% was the average increase under usual or better than usual feeding conditions. It was established that cobalamin supplementation improves food utilization, but this only if the animals get sufficient amino acid and protein to cover the plusproduction.

Author draws attention to the fact that the effect of vitamin B_{12} is greater on animals utilizing their food badly or that are backward in their development, compared with the animals of better than average development. The administration of cobalamin had no significant influence on the proportion of fat and meat, on the meat color, on its firmness and connective tissue contents.

In the author's opinion the effects of cobalamin in the protein metabolism of growing and multiplying cells motivates its use in animal breeding. The effectiveness of cobalamin administration can be enhanced by the feeding of antibiotics. (Hungarian Agricultural Review)

KRATZER, F. H., P. N. DAVIS, and B. J. MARSHALL. (U. California, Davis.)

COTTONSEED MEAL IN RATIONS FOR STARTING POULTS, GROWING TURKEYS AND TURKEY BREEDER HENS. *Poultry Sci. 34(2):* 462-468. 1955.—In 2 battery experiments with poults, cottonseed meal could replace soybean oil meal in the ration to the extent of supplying half of the supplementary protein without retarding poult growth. A ration containing cottonseed meal alone as a source of supplementary protein was deficient in lysine but not methionine. Poults fed rations containing 5% fish meal and the balance of the supplementary protein supplied by soybeal oil meal or soybean oil meal and cottonseed meal in a ratio of 2:1 grew satisfactorily while a ratio of 1:2 caused reduced growth and evidence of a lysine deficiency. The differences were not apparent at market age. Hatchability of fertile eggs was not reduced by 7.2 or 14.4% of cottonseed meal in the breeder ration although pink albumen and olive yolks developed on storage of eggs from these hens.—*F. H. Kratzer.* (Biological Abstracts)

KRATZER, F. H. (U. California, Davis), **PRAN VOHRA, R. L. ATKINSON, and P. N. DAVIS.**

TREATMENT OF DRIED WHEY WITH VARIOUS SOLVENTS; EFFECTS UPON THE GROWTH OF CHICKS. *Proc. Soc. Exptl. Biol. and Med. 89(2):* 273-274. 1955.—Dried whey preparations were tested

by incorporating in purified diets for chicks. Dried whey treated with 70% methanol, 70% ethanol, 70% isopropanol or an equivalent amount of water improved the growth of chicks to which it was fed more than an equivalent amount of untreated dried whey.—*F. H. Kratzer.* (Biological Abstracts)

LANSON, R. K., and J. R. SMYTH. (U. Maine, Orono.)
PELLETS VS. MASH PLUS PELLETS, VS. MASH FOR BROILER FEEDING. *Poultry Sci. 34(1):* 234-235. 1955.—Feeding of pellets to White Plymouth Rock male broilers from the end of the 4th week to marketing at 10 weeks, duplicated earlier work with females in producing superior average weight, per cent gain over 4 week weight, feed conversion, and performance efficiency as compared to the other 2 feeding methods used. Mortality was light in all pens, and there was no evidence of cannibalism or feather picking.—*R. K. Lanson.* (Biological Abstracts)

MacINTYRE, T. M., and M. H. JENKINS. (Canada Exptl. Farm, Nappan, N. S. Canada.)
EFFECT OF DIFFERENT FEEDING METHODS ON THE EFFICIENCY OF EGG PRODUCTION. *Poultry Sci. 34(2):* 376-383. 1955.—Experiments designed to study the effect of different feeding methods on egg production, were carried out over a period of 3 years. A total of 2,400 birds was used in this study. Combinations of grain, mash, and pellet feeding were studied. With the exception of the ad libitum feeding of grain and mash the method of feeding the ration had no significant effect on egg production. The ad-libitum feeding of grain and mash resulted in low egg production. Feed consumption was influenced by the feeding method. Lowest feed consumption was observed on the all mash rations and highest feed consumption on the rations containing pellets. Feed efficiency as measured by pounds of feed per dozen eggs was best for the birds fed all-mash rations. The feeding of pellets resulted in heavier eggs and heavier birds.—*Auth. Summ.* (Biological Abstracts)

MATTERSON, L. D., L. M. POTTER, ANNA KOZEFF, and E. L. JUNGHERR. (U. Connecticut, Storrs.)
THE RELATIVE NON-TOXICITY OF DIPHENYL-P-PHENYLENE DIAMINE (DPPD) TO CHICKS WHEN FED CONTINUOUSLY FOR 12 WEEKS AT THE 1% LEVEL. *Poultry Sci. 34(1):* 239-240. 1955.—Feeding of a practical broiler ration containing 1% DPPD to White Rock chicks through 12 weeks of age, which is 80 times the recommended usage level, had no deleterious effect on growth. Although there were small quantitative changes in the liver and the Purkinje cells of the cerebellum, there were no major evidences of toxicity.—*L. D. Matterson.* (Biological Abstracts)

MONSON, W. J., A. E. HARPER, D. A. BENTON, MARIE WINJE, and C. A. ELVEHJEM. (U. Wisconsin, Madison.)
EFFECT OF ARGININE AND GLYCINE ON THE GROWTH OF CHICKS RECEIVING COMPLETE, PURIFIED DIETS. *Poultry Sci. 34(1):* 186-190. 1955.—Chicks fed synthetic diets containing sucrose and various levels of casein grew more rapidly during the first 2-3 weeks of the experimental period when the gelatin in the diets was replaced with arginine and glycine. Slightly but not significantly, better growth was obtained at 4 weeks when arginine and glycine were added in the presence of 5% or 10% gelatin. When an antibiotic mixture was included in the sucrose diets and when the sucrose was replaced with dextrin, gelatin supported as good or better growth than did arginine and glycine. *Authors.* (Biological Abstracts)

NEAL, WAYNE M.
SUPPLEMENTAL METHIONINE FOR BREEDING HENS. *Poultry Sci. 34(1):* 242-243. 1955.—Use of supplemental dl-methionine

at the rate of 0.05% of the ration with 5 flocks of a meat strain of New Hampshire chickens on 3 different commercial breeder mashes increased the proportion of settable eggs by 5-10%. Shell texture, strength and pigmentation were improved and the proportion of small and medium eggs decreased. Some distorted eggs were produced after the initial supplementation. Hatchability of settable eggs (80-81%) was unaffected. Chronic enteritis was present.—*W. M. Neal.* (Biological Abstracts)

PALAFOX, A. L., and M. M. ROSENBERG. (U. Hawaii, Honolulu.) A COMPARISON OF CERTAIN ANTIBIOTICS IN SEVERAL CHICK STARTER RATIONS. *Hawaii Agric. Expt. Sta. Tech. Bull. 25.* 1-16. 1954.—Six experiments involving 660 straight-run day-old New Hampshire chicks were conducted to ascertain the supplementary value of Terramycin, Aureomycin, penicillin, and vitamin (vit.) B_{12} in practical chick starter rations with or without animal protein. Both Terramycin and a combination of Aureomycin and vit. B_{12} significantly improved a soybean-fish diet containing 6% herring meal when cockerels were used as experimental subjects. No significant increase in the growth of pullets was noted. Either Terramycin, penicillin, or vit. B_{12} did not significantly improve a soybean-basal diet. A combination of Terramycin, Aureomycin, or penicillin, with vit. B_{12} significantly improved the all-vegetable diet containing 36% soybean oil meal. Feed efficiency was improved when an antibiotic and vit. B_{12} were used to supplement diets with or without animal protein. There was a different growth response of the sexes due to antibiotics and vit. B_{12}. In the all-vegetable diets used in this study, antibiotics were only effective in the presence of supplemented vit. B_{12}. The amount of animal protein used in chick diets may be influenced by the cost of the antibiotic and soybean oil meal. It was shown that an all-vegetable diet supplemented with Aureomycin and vit. B_{12} was statistically equal to a soybean-fish ration supplemented with either Terramycin or Aureomycin and vit. B_{12}.—*A. L. Palafox.* (Biological Abstracts)

PALAFOX, A. L., and M. M. ROSENBERG. (U. Hawaii, Honolulu.) A COMPARISON OF HAWAIIAN MEAT AND BONE MEAL, SOYBEAN OIL MEAL, AND HERRING MEAL IN CHICK STRATER RATIONS. *Hawaii Agr. Exp. Sta. Technical Bulletin 8:* 1955.—Four experiments involving 726 straight-run, day-old New Hampshire chicks were conducted to ascertain the use of simple and practical chick starter rations using local meat and bone meal with soybean oil and/or herring meals as the main source of protein concentrate.

Birds fed local meat and bone meal in concentrations of 14.25-16 percent and in combination with soybean oil meal and/or 0-5 percent herring meal weighed 1.76-1.87 pounds. No significant difference between rations was noted.

At 6 weeks of age, chicks fed all-vegetable diets containing soybean oil meal as the main source of protein were statistically equal in body weight to those fed a mainland-style control ration.

In the study of the use of local meat and bone meal, the cost of feed to produce a pound of gain at 42 days of age ranged from 13.0 to 15.5 cents. The birds fed 16 percent each of soybean oil and meat and bone meals and 2.5 percent herring meal (#267) consumed the least amount (13.0 cents) of feed to produce a pound of gain, whereas, the birds fed an all-soybean protein diet (#116) consumed the greatest amount (15.5 cents) of feed. The average weights of birds fed the above two diets were statistically the same.

The average feed consumed for pullets and cockerels to 6 weeks of age ranged from 3.34 to 3.73 pounds. The birds fed 16 percent meat and bone meal (E267) consumed 3.34 pounds whereas, those fed the all-vegetable diet (E116) consumed 3.73 pounds.

There was no significant difference between diets supplemented with 150 mg riboflavin, 900 mg niacin, plus 500 mg calcium pantothenate and diets supplemented with 150 gms of Fortafeed 2-22C when diets used contained either 37.5 percent soybean oil meal or a combination of meat and bone meal, soybean oil meal, and 2.5 or 5.0 percent herring meal. (Author's Summary)

PATRICK, H. (U. Tennessee, Knoxville.)
INFLUENCE OF PROTEIN SOURCE ON CONSUMPTION AND EXCRETION OF WATER AND EXCRETA VOIDED BY BROILER CHICKS. *Poultry Sci. 34(1):* 155-157. 1955.—Influence of adding different protein concentrates to broiler rations on consumption and excretion of water and excreta voided by broiler chicks was studied. Results demonstrated that protein concentrates in general increased the amount of droppings formed as the protein level of the ration is increased. Whereas, some protein concentrations increase the water requirement of broilers, others decrease it. Increasing the protein content of a ration does not always increase feed efficiency. All productions of soybean oil meal or meatscraps do not increase water requirement of broilers.—*H. Patrick.* (Biological Abstracts)

ROSENBERG, M. M. (U. Hawaii, Honolulu.)
B-GRADE MOLASSES IN STARTER, GROWER, AND LAYER RATIONS OF CHICKENS. *Hawaii Agric. Expt. Sta. Bull. 109.* 1-26. 1954.—Feeding (7) trials were conducted with chicks, growing cockerels, and laying pullets to determine the comparative value of B-grade molasses in chicken rations. In these studies B-grade molasses was substituted for yellow corn meal, and, in all but the first trial, adjustments in the levels of herring and soybean oil meals were made to replace the proteins lost by these substitutions. It was found that chickens in the 3 age groups safely tolerated this new feedstuff even when all the cereal grains were replaced by B-grade molasses. Thus, as an emergency feedstuff, B-grade molasses can be depended upon to provide the carbohydrate portion of the chicken's ration during all stages of growth. In the event of restricted shipping, 46.0% of a starter ration, 53.6% of a grower ration, and 61.75% of a layer ration could be provided by B-grade molasses with satisfactory results. Efficiency of feed utilization decreased as the concentration of B-grade molasses was raised. As a consequence, comparatively high levels of B-grade molasses proved to be uneconomical when compared with comparable starter, grower, and layer control rations. Under the conditions that existed during these studies, the most economical concentration of B-grade molasses in chick starter rations ranged between 22.5 and 33.3% of total ration. At these levels growth rates were faster and the costs of feed per pound of gain were less than those of the controls. In the trials with cockerels from 6 to 13 weeks of age, rations containing 17.75 and 18.2% B-grade molasses of total ration supported growth equal to 98.0 and 98.3% of the controls, and at a saving of 0.3 and 0.1 pound of feed per pound of gain, respectively. Higher concentrations of B-grade molasses were uneconomical despite the lower cost of feed. Data obtained with laying pullets in 2 trials have shown that levels of B-grade molasses ranging to 24% of total ration do not adversely affect the rates of ovulation and egg production, incidence of meat- and blood-spot eggs, frequency of soft shell and broken eggs, and increase in egg size. However, feed consumption increased significantly as the concentration of B-grade molasses was raised.—*M. M. Rosenberg.* (Biological Abstracts)

RUNNELS, T. D. (U. Delaware, Newark.)
ANIMAL FAT IN COMBINATION WITH VARIOUS OTHER INGREDIENTS IN BROILER RATIONS. *Poultry Sci. 34(1):* 140-144. 1955.—Results from a broiler feeding experiment using a 3% animal grease, 1.5% dried sardine fish solubles, 6% condensed hydrolized whey and 2.5% dehydrated alfalfa meal combined with a corn-soybean oil meal type basal mash individually and in all combinations are reported. Meat strain, sexed New Hampshire male chicks were used. They were divided into 16 groups of 9 chicks in each group and the groups were distributed at random throughout the battery compartments. By pairing data on body weight at 10 weeks of age it was demonstrated that in each case average weight of birds receiving the experimental variables was heavier than those not receiving these supplements. Differences between treatments, however, were not significant. Feed efficiency was improved 11% by the addition of 3% animal grease to the diet. This

amounted to a saving of .29 pounds of feed per pound of gain, which was highly significant. Differences in feed efficiency attributable to other ingredients were without significance. Results from this experiment add additional data to that already published from other sources which indicate that high grade, inedible animal fat now in surplus supply is a practical ingredient for use in commercial broiler mash.—*T. D. Runnels.* (Biological Abstracts)

SHAW, R. B., and E. W. NIGHTALL. (U. Nottingham, Sutton Bonington, Loughborough, England.)
THE INFLUENCE OF PROTEIN LEVELS ON POULTRY PRODUCTION. *J. Sci. Food Agric. 6:* 390-401. 1955.—The report is divided into three parts. In Part I a comparison is made of the effects of rations with and without protein supplement on chickens and laying pullets with access to grass runs. Evidence is presented that by use of farm-grown foods poultry food costs can be reduced, the only essential purchases being minerals and vitamins.

The chickens having no animal protein grew more slowly than usual and there was a delay in the commencement of egg production of three to four weeks. Satisfactory egg production followed to the extent that in the first year the birds without fish meal in their diet laid more eggs than the birds having fish meal.

It is shown in Part II that under the folding system with folds moved daily, egg production was high and the health of the birds good when no protein supplement was incorporated in the food given to the birds. In two of the three years the birds without fish meal gave a higher average production than the birds having fish meal. Under intensive battery conditions (Part III), however, the need for a protein supplement is definite.

Under all three systems of housing, egg size and shell quality were very satisfactory and similar from all rations used. Small differences in the internal quality of the eggs produced by the birds on different rations is referred to. (Author's Summary)

SIEDLER, A. J., H. E. SCHEID, and B. S. SCHWEIGERT. (Amer. Meat Inst. Foundation, Chicago.)
EFFECTS OF DIFFERENT GRADES OF ANIMAL FATS ON THE PERFORMANCE OF CHICKS. *Poultry Sci. 34(2):* 411-414. 1955.—Effects of the addition of 3 or 6% stabilized feed grade animal fats or 3% stabilized free fatty acids to a high energy broiler ration were investigated. The rates of gain of all groups tested showed no significant difference in either experiment 1 or 2 (duplicate experiments). The animal fats fed were choice white grease, yellow grease, brown grease, prime tallow, No. 2 tallow and fatty acids prepared from choice white grease. Food and caloric efficiency data showed excellent utilization of choice white grease, yellow grease, brown grease or the fatty acid preparation when fed at the 3% level. Some reduction in caloric efficiency was noted when these fats were fed at a 6% level. The tallow supplements were not as well utilized in the 1st experiment as compared to the 2nd experiment. Data obtained on the amount of fat ingested and the amount excreted showed excellent digestibility of the added fat for all groups tested. The eating quality of the birds fed the basal diet or basal+choice grease was compared with the quality of birds fed brown or yellow grease or No. 2 tallow. No differences were evident between groups and all birds were judged excellent. The percentages of free fatty acids contributed by the fats incorporated in these feeds showed no effect on the performance of the chicks. Results indicate that fats properly stabilized are utilized equally well regardless of the free fatty acid content of the fats.—*Authors.* (Biological Abstracts)

SIZEMORE, J. R., R. J. LILLIE, H. R. BIRD, and C. A. DENTON. (U. S. Dept. Agric., Beltsville, Md.)
FURTHER STUDIES ON THE INFLUENCE OF AUREOMYCIN IN THE CHICK DIET UPON SUBSEQUENT REPRODUCTIVE PERFORMANCE OF LAYING HENS. *Poultry Sci. 34(2):* 432-435.

1955.—Rhode Island Red hens reared on the Connecticut broiler ration with and without antibiotic were carried over into the 2nd year to determine the duration of persistence of the hatchability differences. Results of the 2nd year were as follows: (1) Laying house mortality, egg production, and fertility were not influenced by the growing or the breeder diets. (2) The presence of a vitamin B_{12}-antibiotic supplement in the growing diet in 3 of the 4 comparisons, resulted in increased hatchability even during the 2nd year of production. The addition of crystalline Aureomycin to the breeder diet further increased hatchability during the 2nd year of production, in 3 of 4 comparisons. (3) There appeared to be a definite relationship between growing and breeder diets and embryonic mortality during the latter 2 weeks of incubation period. In every case, hens whose growing diet contained an antibiotic showed a lower embryonic mortality than those hens whose growing diet contained no antibiotic. Addition of crystalline Aureomycin to the breeder diet further decreased mortality in embryonic development in 3 of 4 comparisons.—*J. R. Sizemore.* (Biological Abstracts)

SUNDE, M. L. (U. Wisconsin, Madison.)
THE NIACIN REQUIREMENT OF CHICKENS FROM 6 TO 11 WEEKS. *Poultry Sci. 34(2):* 304-311. 1955.—Experiments (4) were conducted with 6-11 week old chickens to determine their dietary niacin requirements. The basal diet contained 21% protein, .21% tryptophan and 1.8 mg/kg of niacin and was made up of sucrose or dextrin, casein, gelatin, minerals, and vitamins. All experiments were conducted in standard electric starting batteries and in standard growing batteries. Slightly more than 7.0 mg and less than 12 mg of available niacin were required for optimal growth of chickens from 6 to 11 weeks. Growth on the basal diet was not depressed from the 6th to the 7th week but was depressed after that time. Additional data on the availability of niacin in ingredients for practical poultry rations is needed before these data can be applied.—*M. L. Sunde.* (Biological Abstracts)

SWART, L. G. (U. Stellenbosch, Union of South Africa.)
FEEDING SYSTEMS FOR LAYING HENS. *Farming in S. Africa 29(344):* 542-543. 1954.—White Leghorn hens which had almost completed their first laying year were divided into 3 duplicate groups consisting of 35 birds/group. The following 3 systems of feeding were tested—(1) mash plus scratch grain (2) all mash and (3) mash plus grain ad libitum. The mash fed with grain contained 21.4% and the all mash 16.6% protein. The average intake of protein in percentage was 14.2, 16.6 and 13.9, respectively. Those hens on the mash plus grain rations consumed approximately 65% grain and 35% mash. In egg production and total feed consumption there was no significant difference between the different groups of hens during the 357 days test period. Egg production varied from 134.8 for the all mash to 141.9/hen for the mash plus grain (ad libitum) group.—*A. M. Gericke.* (Biological Abstracts)

TITUS, HARRY W., JOHN H. BRUMBAUGH, and ARNON L. MEHRING, Jr. (Lime Crest Res. Lab., Newton, New Jersey.)
EVALUATION OF THE EFFECT OF ADDITIONS OF VITAMIN B_{12}, DL-METHIONINE, AND PROCAINE PENICILLIN, SINGLY AND IN COMBINATION, TO CORN-SOYBEAN DIETS FOR YOUNG GROWING CHICKS. *Poultry Sci. 34(1):* 167-177. 1955.—Two experiments are reported. In the 1st experiment, vitamin B_{12} (10μ/lb.) increased the gain of both the males and the females. Effect was maximum at about 4 weeks and then declined to 10 weeks. Vitamin B_{12} also increased feed efficiency for approximately the first 4 weeks. DL-methionine (0.05% of diet) had no consistent effect on gains or on feed efficiency. Procaine penicillin (2.5 mg/lb.) increased the gains made by both the males and the females and tended to improve feed efficiency for the first 4 weeks. In the 2nd experiment, commercial and purified DL-methionine (0.05% of diet were compared); neither one affected the gains made by either sex; but in the presence of procaine penicillin (1.25

mg/lb.) they appeared to increase the gains made by the females. Procaine penicillin, at this lower level, was not effective in increasing gain. Neither the DL-methionine nor the procaine penicillin had a marked and consistent effect of feed efficiency. In both experiments the "pattern of the effects" of the supplements was not the same for the two sexes. Data were analyzed by a "least squares" method developed by the senior author.—*Authors.* (Biological Abstracts)

WELCH, B. E., and J. R. COUCH. (Texas A. and M. Coll., College Station, Texas.)

HOMOCYSTINE, VITAMIN B_{12}, CHOLINE, AND METHIONINE IN THE NUTRITION OF THE LAYING FOWL. *Poultry Sci. 34(1):* 217-222. 1955.—Results of 2 experiments are presented on the utilization of homocystine, B_{12}, choline and methionine for egg production. The basal diet used in these studies was composed of ground split peas as the source of amino acids. The diet contained 0.26% methionine, 0.145% choline and was deficient in vitamin B_{12}. Data show that homocystine can be methylated to form methionine in the body of the mature fowl and there is an indication that B_{12} is concerned in this process. The essential nature of choline in the diet of the mature hen is demonstrated. The rate of methyllation of homocystine to form methionine was apparently not great enough to satisfy the methionine requirement of the hen for egg production under the conditions of these experiments. Methionine determinations on the blood plasma of the hens indicated an increased methionine content upon supplementation of the basal diet with homocystine and B_{12}, as was also the case upon homocystine and choline supplementation. Vitamin B_{12} content of the livers of the birds was affected only by the addition of vitamin B_{12} to the diet. Choline content of the livers did not appear to be related to the dietary supplements. Hatchability proved to be essentially the same in all groups and was to be expected since the birds were not depleted of vitamin B_{12} prior to the experimental period.—*J. R. Couch.* (Biological Abstracts)

WHITE-STEVENS, ROBERT, and H. GEORGE ZEIBEL. (Amer. Cyanamid Co., Pearl River, N. Y.)

THE EFFECT OF CHLORTETRACYCLINE (AUREOMYCIN) ON THE GROWTH EFFICIENCY OF BROILERS IN THE PRESENCE OF CHRONIC RESPIRATORY DISEASE. *Poultry Sci. 33(6):* 1164-1174. 1954.—Five field experiments were carried out in Delaware and Georgia on a total of 54,000 broilers (New Hampshires, Barred Rock Crosses, White Rocks, Vantress Crosses) to determine the efficacy of Aureomycin fed at a "high" level (50-400 ppm of diet) upon the maintenance of growth efficiency in the presence of endemic and applied chronic respiratory disease (CRD). A continuous prophylactic diet containing 50-100 ppm of Aureomycin effectively sustained growth efficiency as compared to unmedicated controls in the known presence of endemic or applied CRD, provided the disease remained subclinical. Under "stress" conditions wherein the disease became clinical it was found that an additional increment of the antibiotic (70 ppm of Aureomycin in the drinking water) to the 50 ppm in the diet was required to reduce clinical symptoms and sustain growth efficiency. In one trial of 20,000 birds a serious outbreak of CRD occurred at 6 weeks on previously unmedicated birds which was successfully reduced by a therapeutic treatment of 400 ppm of Aureomycin in the diet for 14 days followed by 100 ppm from 8 weeks until market at 12 weeks. The evidence indicates that under practical field conditions CRD effects its major expression as morbidity in terms of reduced growth and feed conversion, i.e., growth efficiency and that such losses can be effectively curtailed by feeding 50-100 ppm of Aureomycin in the diet prophylactically.—*R. White-Stevens.* (Biological Abstracts)

WRIGHT, M. M., and F. J. DUDLEY. (Natl. Inst. Poultry Husbandry, Newport, Shropshire, Eng.)

A COMPARISON OF THE EFFECTS OF PELLET AND MASH DIETS OF SIMILAR COMPOSITION ON THE PRODUCTIVITY OF KHAKI CAMPBELL DUCKS TO THE END OF THEIR FOURTH

LAYING SEASON. *Poultry Sci. 34(2):* 474-483. 1955.—The experiment was carried out to obtain information on food consumption, body weight, egg production and mortality of Khaki Campbell ducks from day-old to the end of the 4th laying season and to compare pellet feeding with mash feeding throughout this period. Stock were hatched in three successive years in sufficient numbers to allow 40 birds for each of the total of eight laying hens set up for measuring egg production. At 12 weeks of age feathering and general development were better in the pellet-fed groups than in the mash-fed groups and in most cases superiority in body weight continued to the end of the 4th laying year. There was little difference in total food consumption between the pellet and mash groups. There was an outstanding advantage in egg production in the 1st laying year for the pellet-fed groups and in one case in the 2nd year, but in the 3rd and 4th years the position was completely reversed, so that on balance the advantage of the pellet-fed groups was reduced to the very small difference of 1.2%. The rate of mortality tended to increase slightly with age and in all amounted to just over 40% in the 4 laying seasons, both in the pellet-fed groups and in the mash-fed groups.—*Authors.* (Biological Abstracts)

YACOWITZ, H., E. ROSS, V. L. SANGER, E. N. MOORE, and R. D. CARTER. (Ohio Agric. Expt. Sta., Wooster.)

HEMORRHAGIC SYNDROME IN CHICKS FED NORMAL RATIONS SUPPLEMENTED WITH SULFAQUINOXALINE. *Proc. Soc. Exptl. Biol. and Med. 89(1):* 1-7. Illus. 1955.—Feeding of 0.1% sulfaquinoxaline in the presence of 3-5% alfalfa and 5 mg menadione/lb. of feed resulted in occurrence of a hemorrhagic syndrome in chicks. Hemorrhages closely resembled those encountered in field cases of hemorrhagic disease and, in many cases were accompanied by reduced hematocrits. In some chicks blood clotting time was increased by feeding sulfaquinoxaline but in most birds clotting time was normal. The toxic effect of sulfaquinoxaline was slight in chicks fed the drug starting at day-old or at 2 weeks of age but was more pronounced in chicks fed the drug at 3, 4 or 5 weeks of age. Spontaneous recovery was observed in birds which withstood the initial weight loss and anemia produced by the drug. Dietary penicillin appeared to increase the toxicity of sulfaquinoxaline.—*H. Yacowitz.* (Biological Abstracts)

PATHOLOGY

ERWIN, L. E. (Kansas State Coll., Manhattan.)

EXAMINATION OF PREPARED POULTRY FEEDS FOR THE PRESENCE OF SALMONELLA AND OTHER ENTERIC ORGANISMS. *Poultry Sci. 34(1):* 215-216. 1955.—Test samples (206) of commercially prepared poultry feed were checked for the presence of *Salmonella* and other enteric organisms. Seventy-seven samples produced *Salmonella*-like colonies on differential media. Seventy-three of these cultures were identified as *Paracolobactrum* sp.; 1 as *Proteus mirabilis* and 3 as *Salmonella oranienburg.*—*L. E. Erwin.* (Biological Abstracts)

GARAY, K., and M. SZENT-IVANY

EFFECT OF ULTRASONIC IRRADIATION ON FOWL PEST (NEWCASTLE) VIRUS. [ULTRASZONIKUS SUGARZAS HATASA A BAROMFIPESTIS (NEWCASTLE) VIRUSRA.] *Magyar Allatorvosok Lapja,* Budapest, 1955. 7 pp. 236-238.—The allanto-amniotic fluid of 10 days old chicken embryos infected with Newcastle disease virus was exposed to ultrasonic irradiation.

Under the effect of ultrasonic irradiation, the virulence of the Newcastle virus diminished or completely disappeared. Parallel with this, the haemagglutinating capacity of the virus increased significantly. By the treatment the pH of the irradiated fluid diminished and the virus suspension changed into a colloid solution.

After a single passage the irradiated virus regains its original properties. (Hungarian Agricultural Review)

MIKLOVICH, M., and L. PELLERDY.
INVESTIGATIONS INTO THE EFFECTS OF AN OILY ULTRASEPTYL SUSPENSION AGAINST FOWL CHOLERA. [VIZSGALATOK AZ OLAJOS ULTRASEPTYL-SZUSZPENZIO BAROMFIKOLERA ELLENI HATASAROL.] *Magyar Allatorvosok Lapja.* Budapest, 1953. 2 pp. 50-53.—(1) Mice can be protected against a multiple lethal dose of Pasteurella multiseptica by the subcutaneous injection of 1 g/kg Ultraseptyl suspended in oil. This effect lasts for at least 3 to 4 days. (2) Pigeons can also be protected against a similar dose of Pasteurella multiseptica by subcultaneously injecting them 0.5 g/kg Ultraseptyl in an oily suspension. (3) Chickens can be safeguarded against the lethal dose of Pasteurella multiseptica by the injection of 0.5 g/kg Ultraseptyl in an oily suspension for 4 to 5 days. (4) A study on the Ultraseptyl level of the serum in chickens and pigeons showed that the depot effect of the oily Ultraseptyl suspension lasted for 4 to 5 days. (Hungarian Agricultural Review)

RANBY, P.
THE PRINCIPAL DISEASE PROBLEMS IN OUR POULTRY INDUSTRY. *Queensland Agric. Jour. 78(4):* 226-232. Illus. 1954.—Disease rates high as a cause of economic loss. Six respiratory or roup diseases are seen in Queensland: Infectious laryngo-tracheitis, infectious catarrh, coryza, the respiratory forms of fowl pox and cholera, and vitamin A deficiency. Infectious laryngo-tracheitis, discovered in this country in 1953, is considered the most important; however, all outbreaks so far reported are the mild type. Two respiratory diseases that were not found in Australia are Newcastle disease and fowl pest. Other diseases and pests are leucosis, coccidiosis, blackhead, pullorum disease and salmonellosis, roundworms, blue comb or black comb, botulism, stickfast flea, and fowl tick fever. The respiratory diseases, leucosis and coccidiosis are the "big three."—*T. L. Bissell.* (Biological Abstracts)

SALYI, GY., J. HODOSY, and G. HIRT.
EPIZOOTIES OF FOWL-PEST WITH AN UNUSUAL CHARACTER. [A MEGSZOKOTTOL ELTERO JELLEGU BAROMFIPESTIS-JARVANYOK.] *Magyar Allatorvosok Lapja.* Budapest, 1955. 5 pp. 154-158.—On two farms epizooties of fowl-pest were observed which were characterized mainly by nervous symptoms. As shown by virus cultivation and inoculation of experimental animals, the epizooties were due to a Newcastle disease virus of low virulence. It is pointed out that in the diagnosis of this unusual form of Newcastle disease, manifesting itself mainly in nervous symptoms, a close cooperation between practical veterinary surgeons and diagnostic laboratories is essential. (Hungarian Agricultural Review)

WILSON, J. E. (Ministry Agric., and Fisheries, Laswade, Scotland.)
RECENT DEVELOPMENTS IN POULTRY DISEASES. *World's Poultry Sci. Jour. 10(3):* 252-264. 1954.—Progress in leucosis, an atlas of avian hematology, intra-nasal and spray or dust vaccines for infectious bronchitis, and inoculation of the drinking water are important developments. In 2320 Newcastle disease outbreaks reported in Great Britain, 1.3 million birds were slaughtered from 1951-1953. Repeated, large intra-muscular doses of streptomycin alleviate complicating lung and air sac complications of turkey sinusitis.—*J. B. Christiansen.* (Biological Abstracts)

POULTRY PRODUCTS AND MARKETING

AMSCHLER, J. W., and H. PAMMER. (Hochschule f. Bodenkultur, Vienna.)
AUSMASTVERSUCH VON BRAT-UND BACKHUHNERN MIT AUROFAC-2A BEI GESENKTER RATION TIERISCHEN EIWEISSES. [MAST EXPERIMENTS OF ROAST CHICKEN WITH AUROFAC-2A WHEN THE RATION OF ANIMAL PROTEIN IS LOW.] *Bodenkultur. Oesterreich. Zentralorgan Landwirtsch. u Ernährungs-*

forsch. 7(4): 372-373. 1953.—The experiments are described and the results shortly communicated.—*A. Radermacher.* (Biological Abstracts)

AMSCHLER, J. W., and H. PAMMER. (Hochschule f. Bodenkultur, Vienna.)
MASTVERSUCH MIT BRAD-UND BACKHUHNERN MIT AUROFAC-2A UNTER BESENDERER BERUCKSICHTIGUNG VERSCHIEDENER STUFEN TIERISCHEN EIWEISSES IM GESAMTEIWEISS. [MAST EXPERIMENTS OF ROAST CHICKEN WITH AUROFAC-2A REGARDING THE DIFFERENT DEGREE OF ANIMAL PROTEIN IN THE TOTAL PROTEIN.] *Bodenkultur, Oesterreich. Zentralorgan Landwirtsch. u. Ernährungsforsch. 7(4):* 374-377. 1953. (Biological Abstracts)

DARROW, M. I., and E. O. ESSARY. (Swift and Company Res. Lab., Chicago.)
INFLUENCE OF FATS IN RATIONS ON STORAGE QUALITY OF POULTRY. *Poultry Sci. 34(2):* 427-431. 1955.—Influence of fat supplements in poultry rations on the storage quality of poultry was studied. Tallow at 5% and acidulated cottonseed oil and soybean oil fats (foots) at 5 and 10% each, replacing equal weights of corn in the control ration, were fed for 10 weeks to broiler type New Hampshire chicks. At the 10% level, proteins, vitamins and minerals were adjusted to maintain the caloric-nutrient ratio equal to the control ration. Birds were sacrificed at 10 weeks of age, processed and held in storage at 0° to —50°F. Half of each lot was wrapped in freezer type wax paper and half in a vacuum type, moisture proof film. Organoleptic and peroxide values were obtained from 4 birds fed each ration, wrapped in each material, after 6 and 9 months storage. Organoleptic values were satisfactory and comparable between the control and experimental birds. Peroxide values were not high enough in any lot to indicate rancidity.—*E. O. Essary.* (Biological Abstracts)

FEENEY, ROBERT E. (U. Nebraska, Lincoln.)
THE PROPERTIES OF EGGS IN RELATION TO BAKING AND PRE-MIXES. *Baker's Digest 29(1):* 1-4. Illus. 1955.—The egg white or albumin is primarily a solution of 5 proteins which govern its reactions and properties. The thick egg white has 4 times the concentration of ovomucin of the other layers. Ovalbumin is chiefly responsible for the whipping properties of egg white. The egg yolk is primarily liquid and lipoprotein in construction, really an oil-in-H_2O emulsion with emulsifying properties. The proteins of egg yolk are not as biologically active as those of egg white.—*R. H. Harris.* (Biological Abstracts)

McNALLY, E. H. (U. S. Dept. Agric., Agric. Res. Serv., Beltsville, Md.)
MEAT YIELD FROM LIVE DRESSED AND EVISCERATED RHODE ISLAND RED CHICKENS DURING GROWTH AND AT MATURITY. *Poultry Sci. 34(1):* 145-148. 1955.—Regression equations for the interrelation of weights of live, dressed, and eviscerated Rhode Island chickens and the edible meat were calculated for 125 pullets, 85 cocks and 30 hens ranging from 1134 to 3628 g live weight. Linear equations were found to give an accurate method of calculation of the various yields. Equations for cockerels, pullets, cocks, and hens were similar enough so that over-all equations could be used on most occasions for both the young and mature birds of either sex.—*E. H. McNally.* (Biological Abstracts)

McNALLY, E. H. (U. S. Dept. Agric., Agric. Res. Serv., Beltsville, Md.)
CALCULATION OF THE MOISTURE AND PROTEIN CONTENT OF MARKET CHICKENS FROM THE FAT CONTENT. *Poultry Sci. 34(1):* 152-155. 1955.—The crude chemical components, fat, protein, moisture, and ash of poultry meat show an interrelation of values. Linear regression lines may be calculated for the relation of the fat content to the moisture, protein and ash content of the poultry meat. Growth, fattening and sex do not effect the crude chemical composition

as calculated on a fat free basis or from regression lines calculated from the fat content.—*E. H. McNally.* (Biological Abstracts)

MILNE, F. N. J. (Queensland Dept. Agric. and Stock, Brisbane, Queensland.)
THE EFFECT OF BENZENE HEXACHLORIDE IN POULTRY FEED ON MEAT AND EGG QUALITY. *Queensland Jour. Agric. Sci. 10(4):* 214-221. 1953.—Benzene hexachloride (BHC) dust (12.5% gamma isomer) and a deodorized form (99% gamma isomer) were fed to poultry in a mash at levels equivalent to 5 ppm and 25 ppm of gamma isomer to study effect on meat and egg quality. Cockerels were fed treated mashes from 12 weeks of age. Flesh was found to be tainted within 5 weeks when fed the 12.5% gamma isomer BHC at 25 ppm and within 7 weeks at 5 ppm. No taint was found in cockerels fed the 99% gamma isomer material continuously for 16 weeks. Pullets were fed treated mashes from 6 months of age. Taint was detected in eggs of the pullets fed mashes containing 12.5% gamma isomer after 4 weeks of feeding at the 25 ppm level and after 6 weeks at the 5 ppm level. Pullets fed 99% gamma isomer at 25 ppm and 5 ppm produced tainted eggs 16 and 18 weeks, respectively, after feeding.—*C. T. Schmidt.* (Biological Abstracts)

TOTH, P., and J. BOGRE.
QUALIFICATION OF FULL-GROWN FATTENED GEESE BASED ON SLAUGHTER TESTS. [A KIFEJLETT HIZOTTLIBAK MINOSITESE, VAGOPROBA ALAPJAN.] *Baromfiipar,* Budapest, 1955. May to June, pp. 4-10.—Extraordinary valuable characteristics of the improved Hungarian geese are low pretention, good fattening ability and a great liver developing capacity.

Authors worked out a qualification method with the purpose of developing the favorable economic characteristics of Hungarian geese further by way of breeding.

This system endeavors to create a uniform basis for the qualification of full-grown fattened geese. Its aim is to establish the breeding value of the parents and their descendants by progeny testing on the basis of progeny quality.

For an accurate comparison of the examined individuals a uniform judging system was worked out. The qualification is accompished on the basis of food utilization and slaughter test.

Based on the slaughter test the examined fowls may, at the most, get 100 scores of which 85 may be awarded by exact measuring and 15 by organoleptic examination.

Among the favorable economic characteristics, firstly the fat- and liver-yield, as well as the food utilization capacity must be taken into consideration. Besides these, in the course of selection for breeding, great attention must be paid also to the development of other favorable economic characteristics. (Hungarian Agricultural Review)

TRUSSELL, PAUL C. (B. C. Res. Council, Vancouver, Canada.)
BACTERIAL SPOILAGE OF SHELL EGGS. I. BACTERIOLOGY. *Food Technol. 9(3):* 126-129. 1955.—The significance of fluorescent and non-fluorescent bacteria in the spoilage of fresh, shell eggs from farms in British Columbia was investigated. Although all bacteria were Gram-negative, a considerable proportion were non-fluorescent. In a survey involving 4821 eggs, 4.9% were found to be potentially spoilable by bacteria, and 18.5% of the spoiled eggs were infected only with non-fluorescent forms. The efficacy of UV light for detection of bacterial spoilage was studied. Infection of the eggs was found to occur during wet-washing of eggs, by soiling and by nesting materials.—*P. C. Trussell.* (Biological Abstracts)

TRUSSELL, P. C., C. O. FULTON, and C. J. CAMERON. (British Columbia Res. Council, Vancouver, Canada.)
BACTERIAL SPOILAGE OF SHELL EGGS. II. INCIDENCE OF SPOILAGE IN EGGS FROM NINETY-FOUR FARMS. *Food*

Technol. 9(3): 130-134. 1955.—A survey of eggs from 94 farms located in the Fraser Valley area of British Columbia has shown that about 70% of the farms are submitting eggs to market that are infected with spoilage bacteria to the extent of 1% or more. The present methods of wet-cleaning of eggs, both manual and mechanical, are mainly responsible for infection. Although mechanically washed eggs from some farms were free from infection, in general they were more likely to be infected than eggs cleaned in other ways. Eggs from New Hampshires are less susceptible to bacterial spoilage than eggs from Leghorns and crossbreeds because wet-washing of eggs from New Hampshires does not increase the bacterial spoilage significantly.—*P. C. Trussell.* (Biological Abstracts)

TRUSSELL, P. C., R. E. TRIGGS, and B. A. GREER. (British Columbia Res. Council, Vancouver, Canada.)
BACTERIAL SPOILAGE OF SHELL EGGS. III. FARM PRACTICES PROMOTING SPOILAGE. *Food Technol. 9(3):* 134-137. 1955.—The spoilage of unwashed, nest-clean eggs from standard litter nests or from wire, roll-away nests, is too low to be of concern in the commercial marketing of eggs. Dirty trays do not cause a significant increase in bacterial spoilage of the eggs packed in them. Heavy soiling of eggs on the farm results in a significant increase in spoilage over that found in unwashed, nest-clean eggs, and it is sufficiently high to constitute a problem when such eggs are cleaned and brought into the commercial market. Mechanical wet-washing of eggs, even when carried out to the best of the farmers' abilities, results in sufficient bacterial spoilage of the eggs to be of grave concern in commercial operations.—*P. C. Trussell.* (Biological Abstracts)

ZIEGLER, FRANK. (State Coll. Washington, Pullman.), **and WILLIAM J. STADELMAN.**
THE EFFECT OF DIFFERENT SCALD WATER TEMPERATURES ON THE SHELF-LIFE OF FRESH, NON-FROZEN FRYERS. *Poultry Sci. 34(1):* 237-238. 1955.—The effect of scalding chicken fryers at 128°F or 140°F on shelf-life of fresh meat was determined using 60 birds. It was found that birds scalded at the lower temperature kept for approximately 1 day longer than birds scalded in the higher temperature under the conditions of this study.—*W. J. Stadelman.* (Biological Abstracts)

MANAGEMENT

ATKINSON, J. C., R. BENNETT, and E. W. CALLENBACH. (Pennsylvania State U., University Park.)
TEMPERATURE VARIATION IN BATTERY BROODERS AS RELATED TO EXPERIMENTAL DESIGN. *Poultry Sci. 34(2):* 301-304. 1955.—Investigations utilizing battery brooders should be so designed that effects of temperature in the battery room, in batteries as a whole, and in decks or portions of batteries are given adequate consideration. Conditions of inferior room temperature control require more numerous treatment replicates with a small number of experimental individuals per replicate whereas superior room conditions require less replicates but a larger number of individuals per replicate. Replicates should be so arranged as to reduce effects of battery, deck, or battery x deck.—*Auth. summ.* (Biological Abstracts)

BIGLAND, C. H., and E.E. BALLANTYNE. (Vet. Serv. Bch., Edmonton, Alberta, Canada.)
AN EXPERIMENT IN HATCHERY FUMIGATION. *Canadian Jour. Comp. Med. and Vet. Sci. 19(4):* 117-125. 1955.—A method of fumigating the Smith hatcher-setter type of machine is given, employing 0.7 cc of formalin and 0.47 g of potassium permanganate for 20 minutes, followed by neutralization with 0.35 cc of 25% ammonium hydroxide per cubic foot. There was no embryo mortality with 4 test fumigations at

84 hour intervals. Fumigation reduced the bacterial populations on clean surfaces but did not penetrate feces on dirty eggs.—*R. Gwatkin.* (Biological Abstracts)

CAMP, A. A., H. T. CARTRITE. (Texas Agric. Expt. Sta., Gonzales, Texas), **J. H. QUISENBERRY, and J. R. COUCH.**
DEBEAKING IN COMMERCIAL BROILER PRODUCTION. *Poultry Sci. 34(2):* 371-375. 1955.—The use of debeaking for the control of feather picking and cannibalism had been reported as early as 1946. Up to the present time the experiments reported on the use of debeaking have been run in batteries; therefore, this study was initiated in order to ascertain the value of block-type debeaking, in which approximately 1/3-1/2 of both the upper and lower beaks were removed at 1 day and 6 weeks of age. Growth rate, feed efficiency, market quality, and feather score were used as criteria of the value of the debeaking operation. Results of these experiments indicate that a block-type of debeaking results in a better growth rate of males when carried out at 1 day or 5 weeks of age. The growth rate of the male birds was affected more by debeaking than that of the females. In comparing 2 types of litter, the use of peanut hull litter instead of sand litter did not significantly affect the growth rate. Feed efficiency appeared better when the birds were debeaked or when peanut hull litter was used. Feather score was significantly better when debeaking or peanut hull litter was employed. Live market grade of both males and females was significantly better in birds receiving the block-type debeaking. Market grade was also improved in 3 of the 4 comparisons when peanut hulls were used.—*J. R. Couch.* (Biological Abstracts)

CARSON, J. R. (U. Connecticut, Storrs), **and GEOFFREY BEALL.**
ABSENCE OF RESPONSE BY BREEDER HENS TO ULTRAVIOLET ENERGY. *Poultry Sci. 34(2):* 256-262. 1955.—Irradiation of pullets with 14 hours of antirachitic UV energy (2,800-3,200A) or continuous germicidal UV energy (2,537A) in conjunction with a basic treatment of 14 hours of incandescent light per day did not result in an improvement in egg production. Egg weight, shell thickness, hatchability and mortality were not affected by the treatments.—*J. R. Carson.* (Biological Abstracts)

COLES, R., and J. R. UNDERWOOD.
SOME OBSERVATIONS ON HATCHING RATES IN HENS' EGGS. *Empire Jour. Expt. Agric. 22(88):* 281-292. Illus. 1954.—Surveys showed that 1/3 of all eggs set in commercial trade failed to hatch. Experiments showed that the present infertility level of 15% could not be lowered, that incubator design improvements have not affected the hatching rates, that pre-handling and storage may affect the hatching percentage more than incubation processes, that fertile eggs set by experienced breeders give a higher hatching rate than those set by inexperienced poultry keepers, gross nutritional deficiences probably causing this difference, and that disease may affect the hatching more than is realized. Future breeding stock should be selected from chicks hatched from eggs having an approximately identical time-lapse between setting and pipping.—*From Auth. summ.* (Biological Abstracts)

DOBIE, JOHN B., and LEROY C. KLEIST. (U. California, Davis.)
HEATING POULTRY DRINKING WATER. ELECTRICALLY HEATING POULTRY WATERING SYSTEMS BY DIFFERENT METHODS TESTED FOR ECONOMY OF OPERATION. *World's Poultry Sci. Jour. 10(3):* 270-271. Illus. 1954.—Electric heating cable running through the inside of the water pipe (0.5 inches diameter) consumed 0.07 watts/degree F below 32°. Requirement with the cable spiralled around the pipe was about double. The pipe as a heating element was of intermediate efficiency. Larger pipe used more current.—*J. B. Christiansen.* (Biological Abstracts)

ERASMUS, J. E. (U. Stellenbosch, Union of South Africa.)
USEFULNESS OF PART-TIME PRODUCTION RECORDS IN LAYING HENS. *Farming in S. Africa 29(345):* 569-571. 1954.— Production records of 1163 White Leghorn hens consisting of full and half-sister groups were analyzed. For part-time production the 1st of July (Southern hemisphere) was chosen because at that date most hens are in production for a few months, winter pauses are included, day-length is increasing and egg production is improving. In this analysis it was necessary to select 19% of the flock on the 1st of July to ensure that none of those constituting the best 10% on the 1st of December would be excluded; that is, if selection is applied on an individual basis approximately twice the number of hens required for breeding may be selected on the 1st of July. The rating of families was not so easy as in individual selection. Although no general deductions can be made from the order of merit of individuals and families on the 1st of July and the 1st of December, it is nevertheless an indication that if by the middle of the year the selection intensity is one half as great as is actually necessary, no valuable material will be lost but the saving in respect of labor will be considerable.—*A. M. Gericke.* (Biological Abstracts)

HALL, ARTHUR E. (Michigan State Coll., E. Lansing.)
FATAL HEMORRHAGES IN CHICKENS POSSIBLY DUE TO RAPE PASTURE. *Michigan State Coll. Vet. 14(3):* 148-149. 1954.— Thirteen deaths in 450 chickens on grain feed and rape pasture were due to hemorrhage from small cuts. 4 days after removal from the pasture, losses stopped.—*J. F. Ryff.* (Biological Abstracts)

KOSIN, I. L., and M. S. MITCHELL. (State Coll. Washington, Pullman.)
AMBIENT TEMPERATURE AS A FACTOR IN TURKEY REPRODUCTION, I. THE EFFECT OF PREHEATING MALES AND FEMALES ON THEIR SUBSEQUENT BREEDING PEN PERFORMANCE. *Poultry Sci. 34(2):* 484-496. 1955.—Effect of 3 premating treatments of females and 2 of males on their reproductive performance was studied in a population of 240 hens and 24 males of the Broad Breasted Bronze variety. Treatments involved (a) "preheating", (b) holding in semi-protected quarters and (c) holding in outdoor pens. During mating, the birds were subjected to 3 environments in the following combinations: (1) The outdoor and preheated type males mated to the preheated hens kept under conditions described in (b) above. During mating all birds in this combination were kept in controlled temperature quarters (environment I). (2) The combination described under (1) above was mated in a regular type breeder house (environment II). (3) The outdoor and preheated type males were mated outdoors to the preheated and type (c) females (environment III). In general, the fertilizing capacity of the males, regardless of their premating background, was strongly influenced by the environment to which they were subjected during breeding. The benefit of preheating was most pronounced in environment III. In environments I and II the fertilizing capacity of the males was determined by the type of male-female combination. The more alike were their premating treatment background, the greater was the male's fertilizing capacity. Keeping hens under controlled temperature conditions during the mating season, with the temperature maintained at 50°F, was detrimental to their egg laying rate due to increased broodiness. The preheating of hens resulted in higher initial egg laying rate.—*I. L. Kosin.* (Biological Abstracts)

WRIGHT, M. L., and R. B. TRUSCOTT. (Ontario Agric. College, Guelph, Canada.)
FORMALDEHYDE FUMIGATION IN HATCHERIES. *World's Poultry Sci. Jour. 10(3):* 272-276. 1954.—Based on bacteriological studies of samples before and after fumigation in hatcheries, recommendations were standardized at 20 minutes using 1.5 cc formalin and 1 g potassium permanganate/cu. ft. for forced air incubators. Gravity incubators require 2.5 cc of formalin and 1.8 g of permanganate. *S. pullorum* was usually not found in setters. 24-84 hour embryos should not be fumigated. Hatchers should be fumigated twice.—*J. B. Christiansen.* (Biological Abstracts)

GENERAL

DENINGTON, EFFIE M., and ALFRED M. LUCAS. (U. S. Reg. Poultry Res. Lab., East Lansing.)

BLOOD TECHNICS FOR CHICKENS. *Poultry Sci. 34(2):* 360-368. Illus. 1955.—The Schultz and Elvehjem (1934) method for hemoglobin determinations in avian blood were modified by increasing the amount of acid three-fold; this eliminated all turbidity as tested against a Tyndallmeter. Use of Van Allen hematocrit tubes has numerous advantages over other methods for avian blood where a large number of determinations are to be made. The buffy coat of avian blood is composed of about equal parts leucocytes and thrombocytes, rather than largely of leucocytes as in mammalian blood. Not all samples of Wright's stain are satisfactory for staining avian blood smears. A good stain needs no buffers. Staining time for avian blood varied from 5 minutes for the dye and 5 minutes for the water to 9 and 9. Methods (3) for determining total white cell counts were compared, the coefficient of variability was 17.0% for the direct method (Rees-Ecker), 39.5% for the semi-direct method (Wiseman), and 50.9% for the indirect method (WBC/RBC ratio on the slide). An indirect method for counting thrombocytes which seems to give reliable results is described. Specifications are given for a tray for holding and transporting 15 sets of tubes and slides for blood determinations.—*A. M. Lucas.* (Biological Abstracts)

OHTANI, INEKO. (Kyoto U. Sch. Med., Japan.)

THE INFLUENCE OF CORTISONE ACETATE ON THE GROWTH OF TISSUES CULTIVATED IN VITRO. *Japanese Jour. Bact. 10(2):* 145-149. 1955.—Varied concentrations of cortisone acetate were added to the flasks in which tissue fragments of the heart, iris, and spleen of chicken-embryos were cultivated. The growth of tissues was measured by the planimeter. High concentrations (500-25 μg/ml) of cortisone acetate showed a marked inhibition on all kinds of tissues, whereas concentrations between 0.05 μg/ml and 0.0025 μg/ml enhanced the growth of heart and spleen. The growth of iris was poorest compared with the other tissues and was not remarkably stimulated by any concentration of cortisone acetate. The lowest concentration of cortisone acetate tested (0.00125 μg/ml) had no influence upon the growth of tissues.—*D. Ushiba.* (Biological Abstracts)

SKALLER, F. (C.S.I.R.O. Poultry Res. Centre, Werribee, Victoria, Australia.)

POULTRY AT THE INSTITUTIONAL LEVEL IN AUSTRALIA AND NEW ZEALAND. *World's Poultry Sci. Jour. 11(1):* 7-9. 1955.—Commercial flocks of more than 100,000 layers are located in New South Wales and Victoria where 70% of Australian market eggs are produced. Each state provides for accreditation of pullorum-free flocks. Random sample egg laying tests are providing results of about 200 eggs for survivors. State experiment farms deal primarily with feeding tests and management studies, with more specialized research being the responsibility of the Commonwealth Scientific and Industrial Research Organization.—*J. B. Christiansen.* (Biological Abstracts)

WEBER, F. (Swiss Fed. Inst. Technol., Animal Breed. Inst., Zurich.) 1955.

ERGEBNISSE UND ERFAHRUNGEN AUS DEM ERSTEN SCHWEIZERISCHEN STICHPROBENTEST IN DER GEFLUEGELZUCHT. [RANDOM SAMPLE TEST RESULTS.] *"Der Geflügelhof"* 1955/41.—A first trial random sample test with four groups of White Leghorns was started April 15th 1954 at the Experiment Station Chamau. The test began with 4 x 70 randomly chosen unsexed chicks. 135 hens were housed, 93 completed the test on Aug. 31st, 1955.

The results were as follows:

Egg production hens housed	181.3
Egg production survivors	234.8
March egg weight	58.4 g

It was concluded that the random sample test rather than the progeny test is the appropriate testing method to suit the requirements of the breeder and buyer in this country.—(Author's summary)

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TO MEMBERS OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

BRANCH NEWS

Australia — Centuries are commonplace in Australia, particularly in the cricket world. Another century has been achieved but in another direction. The membership of the Association in Australia has now (10th May, 1956) reached 104 and this is due to the excellent and hard work of Mr. F. Skaller to whom we extend our heartiest congratulations and thanks. It is intended to form an Australian Branch in the near future.

The fee of members in Australian currency is £1. 5s. 2d. Remittances for that amount, plus the exchange rate, should be made payable to the "F. Skaller Trust Account" and forwarded to Mr. F. Skaller, C.S.I.R.O., Poultry Research Centre, Werribee, Victoria. This does not apply to members of the Western Australian Poultry Science Association, who pay their subscriptions through Major G. D. Shaw.

The formation of an Australian Branch was decided at a meeting in Sydney on May 11, 1956, and provisional Rules for the Branch adopted. During the initial period, until proper election can be held, the following will act as Officers of the Branch:

President—Mr. F. Skaller
Vice-President—Mr. V. H. Brann
Secretary-Treasurer—Mr. A. O. Moll

Mr. Skaller will continue to act as Treasurer to the end of the present financial year.

The setting up of State sub-branches is contemplated in the near future in those States with a minimum membership of 20, that is at present in New South Wales and Victoria.

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United Kingdom—The tenth Annual General Meeting of the United Kingdom Branch was held on 20th April at the Royal Veterinary College, London. A gratifying feature of the Secretary's report was that the membership at 31st December, 1955, had reached 400, all fully paid. The Annual Balance Sheet reflected a sound financial position with a credit balance of £161. 7. 8d.

The Meeting was followed by a Conference at which Papers were presented dealing with Poultry Behaviour and the Artificial Insemination of Poultry. Dr. D. G. M. Wood-Gush of the Agricultural Research Council's Poultry Research Centre, presented the Paper on Poultry Behaviour. Three Papers were presented on the Artificial Insemination of Poultry by Miss D. M. Cooper, Houghton Poultry Research Centre, Mr. A. J. Rainford, Land Settlement Association Ltd. and Mr. J. Bradbury of the Coltishall Breeding Station. A lively and stimulating discussion followed on the submission of the Papers.

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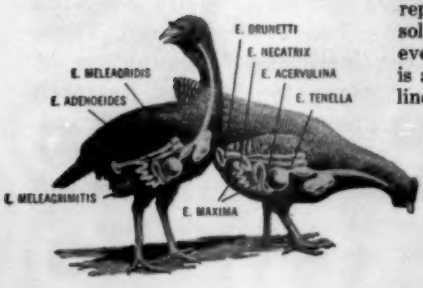

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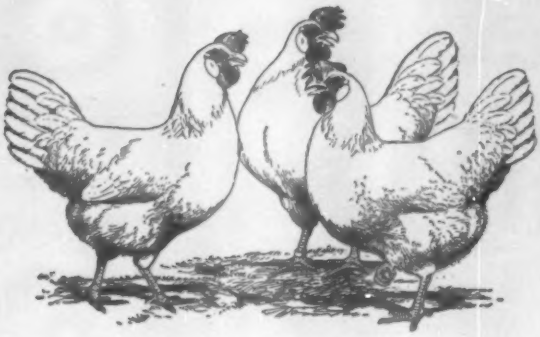

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Each month U.S.I. publishes a full page FEED NEWS in the leading publications reaching nutritional and feed formulation specialists. Informative items of interest to all who use feeds and feed supplements are included. Follow this series in U.S. feed publications for new developments in the poultry feeding industry, or send us your name, address and title on your company letterhead to be placed on our mailing list.

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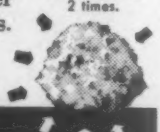

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